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AMPHIBIOUS VEHICLES

DEPARTMENT OF THE NAVY · UNITED STATES MARINE CORPS

U.S. MARINE CORPS

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DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
WASHINGTON, D.C. 20380

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FOREWORD

1. PURPOSE

This publication, FMFM 9-2, Amphibious Vehicles, sets forth the doctrine, tactics, and techniques to be employed in amphibious vehicle operations and training within the Fleet Marine Forces.

2. SCOPE

This Manual covers the organization and principles of employment of amphibious vehicle units. It discusses the mission, combat organization, command relationships, and special considerations affecting amphibious planning for these units. Also discussed are training, maintenance, and communication techniques.

3. SUPERSESSION

FMFM 9-2, Amphibious Vehicles, dated 11 March 1975.

4. CHANGES

Recommendations for improvement of this Manual are invited from commands as well as directly from individuals. The attached User Suggestion Form should be utilized by individuals and forwarded to the Commanding General, Marine Corps Development and Education Command (Code D 03), Quantico, Virginia 22134.

5. CERTIFICATION

Reviewed and approved this date.

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

JC Fegan
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Lieutenant General, U.S. Marine Corps
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AMPHIBIOUS VEHICLES

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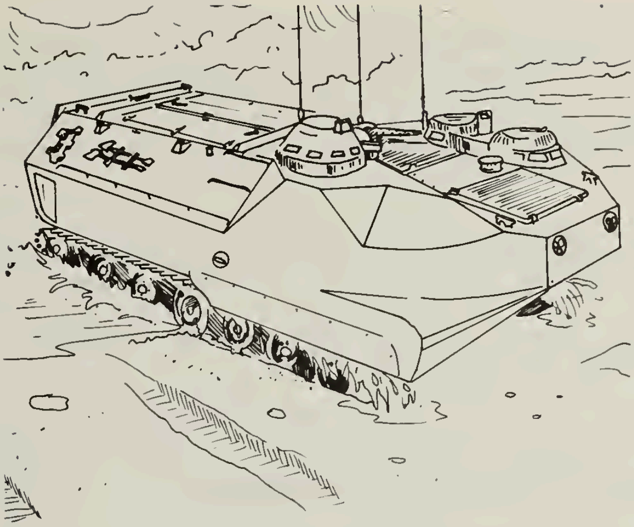


CHAPTER 1

GENERAL

Section I. INTRODUCTION

1101. GENERAL

a. This manual provides a basis for standardizing procedures used by amphibious vehicle units in logistics and tactical support to the landing force and its elements. Command and staff duties are treated broadly except as they pertain to the amphibious unit requirements and tactical employment. The "List of References" furnishes a list of other doctrinal publications to be used with this manual.

b. Diversified means of effecting a ship-to-shore movement and supporting subsequent operations ashore are essential to the success of the amphibious operation. A diversification of amphibious vehicles supporting the amphibious assault and subsequent operations ashore magnifies the enemy's defense problems.

c. In placing the landing force ashore, it is normally necessary to include surfaceborne landings as part of the overall landing plan. Such an assault is most successful when it can penetrate inland to seize assigned objectives with minimum loss of momentum at the beach. The units and amphibious vehicles discussed in this manual are designed to assist in the execution of the assault against defended beaches and to ensure impetus in the attack through the beach obstacles and defenses. These vehicles sustain the penetration through their ability to supply the assault echelons from ships at sea.

1102. DESIGNATION AND CLASSIFICATION OF VEHICLES

a. Design.--Amphibious vehicles are designed to operate afloat or ashore without modification. They are able to negotiate offshore obstacles which limit the use of landing craft. The tactical advantages of uninterrupted movement to and across the beach, coupled with their inland operational capabilities, are superior to those provided by landing craft.

b. Classification.--Amphibious vehicles are classified by contemplated employment and their means of propulsion.

(1) Employment.--Certain classes of vehicles have as their primary mission the transportation of troops, equipment, and supplies. These include the LVT and the amphibious cargo carriers (M116 and M733).

(2) Propulsion.--The LVT is propelled afloat by water jet propulsion and/or tracks and ashore by tracks.

c. Designation.--Amphibious vehicles are designated as follows:

(1) Assault Amphibious Personnel Carrier, LVTP7.--A personnel and cargo carrier designated as a landing vehicle, tracked.

(2) Assault Amphibious Command and Control, LVTC7.--A command and control vehicle designated as a landing vehicle, tracked, command, and control.

(3) Assault Amphibious Recovery, LVTR7.--A recovery and maintenance vehicle designated as a landing vehicle, tracked, recovery.

(4) M116.--An amphibious vehicle designated as carrier, cargo, amphibious, 1½ ton, M116.

(5) M733.--An amphibious vehicle designated as carrier, cargo, armor, amphibious 1½ ton, M733.

d. Characteristics.--Appendixes A through E contain descriptive data of the characteristics of each of the preceding amphibious vehicles, with an illustration of each.

e. Amphibious Vehicles of Other Services.--Appendixes F through H contain descriptive data concerning three amphibious vehicles employed by the U.S. Army and the U.S. Coast Guard: the LARC V, LARC XV, and LARC LX. This information has been included to assist planners employing these vehicles in joint operations and to present information on all amphibious vehicles available to any Service.

1103. MISSION AND EMPLOYMENT

a. Mission.--The mission of the LVT is to land the surface assault elements of the landing force and their equipment in a single lift from assault shipping during amphibious operations to inland objectives and to conduct mechanized operations and related combat support in subsequent operations ashore.

b. Employment.--Amphibious vehicles are employed during the amphibious assault, during the conduct of river crossings, as components of a mechanized task force, and during other special operations ashore. (See sec. V.) When properly employed, they are effective in operations after dark. They may be employed in certain types of swamps, in selected arctic terrain, in hilly areas, during desert operations, and on the majority of rough trails. Mountains, jungle areas, and certain types of mud flats often limit the employment of amphibious vehicles. LVT's are primarily employed to transport personnel in tactical operations. If assets permit, they may be utilized as cargo carriers forward of the forward edge of the battle area (FEBA), and in the forward defense area.

1104. ORGANIZATION OF AMPHIBIOUS VEHICLE UNITS

All amphibious vehicle units are organic elements of Force Troops, Fleet Marine Forces. Units are normally organized as assault amphibian battalions. The standard assault amphibian battalion is composed of four assault amphibian companies and a headquarters and service (H&S) company. The light assault amphibian battalion is composed of two assault amphibian companies and a reduced H&S company. Included in the H&S company are the assault amphibian platoon for logistic support of the battalion; maintenance, communication, and supply elements of the battalion; and a battalion and company headquarters. The assault amphibian company consists of four LVTP platoons and a company headquarters which contains maintenance and communication elements of the company. The assault amphibian company is capable of independent operations for short periods of time.

Section II. PLANNING AND MOVEMENT TO THE OBJECTIVE AREA

1201. GENERAL

The planning principles for employing amphibious vehicles in the amphibious operation are common to all units. Thorough planning and proper execution are required to ensure that amphibious vehicles are embarked, loaded, and launched so as to support the ship-to-shore movement and are provided with ample logistic backup to continue that support. Proper allocation of vehicles within the force and careful attention to each unit's capabilities and limitations ensure maximum support for the landing force. Planning, organization for combat, liaison between units, embarkation of amphibious vehicles, a system of maintenance, and the conduct of realistic rehearsals are critical prerequisites to successful amphibious vehicle employment. See appendix I for procedures to be followed in planning for infantry-LVT operations.

1202. ORGANIZATION FOR COMBAT

The organization of amphibious vehicle units for commitment to combat is determined through consideration of the mission, organization, scheme of maneuver of the landing force, and terrain and hydrography within the objective area. Amphibious vehicle units are organized so as to best support the landing force needs. Exploitation of the capabilities of the different classes of amphibious vehicles and minimizing their limitations is accomplished during planning. Tactical integrity of amphibious vehicle units is retained where possible.

a. Command Relationships.--The four most commonly established command relationships are:

(1) Attachment.--The amphibious vehicle unit, or element thereof, is temporarily attached to the command which is to be transported or supported, and is fully under command of that unit commander. The supported commander is responsible for the operational control and logistic support of the attached amphibious vehicle unit. When units are attached, the commander performs the duties of a special staff officer on the staff of the supported unit commander. Amphibious vehicle units are normally attached to subordinate elements of the division/landing force only when that element is on a separate mission or requires the services of amphibious vehicles over a long period of time on a continuing basis. The logistic and maintenance requirements to support an amphibious vehicle unit must be carefully considered prior to their being attached to a unit below division/landing force level.

(2) Assignment.--The amphibious vehicle unit, or element thereof, is assigned to an organization on a relatively permanent basis. Their primary function is controlled and administered by that organization. The difference between attachment and assignment lies in the permanence of the arrangement. In all other areas, assigning an amphibious vehicle unit is comparable to attaching it.

(3) Support.--When in support, an amphibious vehicle unit is under command of its parent unit, but supports another specific unit. The supporting amphibious vehicle unit answers directly to the supported unit's

requests for support. Command and logistic support of the amphibious vehicle element remain with the parent unit. Support is normally utilized for accomplishment of a specific mission or for a specific length of time.

(4) Operational Control.--When placed under operational control of a unit, the amphibious vehicle unit, or element thereof, is placed under another commander for assignment of tasks and authoritative direction to accomplish a mission. Operational control does not include administrative or logistic authority, or other functions or command. (See JCS Pub 1, Department of Defense Dictionary of Military and Associated Terms.)

b. Combined Employment.--A combination of command relationships may be employed. As an example, a unit may be attached to the landing force and have one of its elements attached to a subordinate landing force unit, with other elements remaining in support.

c. Liaison.--Upon receipt of an order directing support or attachment, amphibious vehicle unit liaison officers are sent to the headquarters of the supported unit to assist that commander in the employment of amphibious vehicles. The amphibious vehicle unit commander then may function as a special staff officer. The assignment of competent personnel to this liaison role is mandatory to ensure that plans include accurate information and are operationally sound regarding the employment of the amphibious vehicles. (See pars. 1203 and 1204.)

1203. PLANNING REQUIREMENTS

Planning is initiated upon receipt of the order alerting amphibious vehicle units to forthcoming operations. All planning is coordinated with other elements of the landing force involved in employment of the vehicle unit(s).

a. Recommendations.--Amphibious vehicle unit commanders make planning recommendations in the following areas:

(1) Shore-based and afloat training.

(2) Missions and task assignments for amphibious vehicle units.

(3) Organization for embarkation and landing.

(4) Techniques of ship-to-shore movement.

(5) Employment of amphibious vehicles ashore.

(6) Supply and maintenance considerations.

(7) Safety considerations affecting amphibious vehicle employment.

(8) Amount and type(s) of augmentation required by amphibious vehicle unit(s).

b. Intelligence.--Consult FMFM 2-1, Intelligence, for a detailed listing of intelligence requirements for amphibious operations. The following intelligence information concerning the objective area is of primary importance to amphibious vehicle unit commanders during planning:

(1) Hydrography.

(2) Prevailing surf conditions.

(3) Tides and currents.

(4) Trafficability of the beach.

(5) Exits from the beach.

(6) Trafficability of inland terrain.

(7) Number, type, and strength of enemy beach defensive installations.

(8) Enemy offshore underwater defensive barriers.

(9) Enemy armor capabilities.

1204. LANDING DOCUMENTS OF SIGNIFICANCE TO AMPHIBIOUS VEHICLE UNITS

The planning documents completed by the landing force in connection with waterborne movements from ship to shore are of vital concern to participating amphibious vehicle units. These documents assign amphibious vehicle units to elements of the landing force, prescribe loads, stipulate landing formations, and in some instances, provide for amphibious vehicle employment subsequent to the landing. FMFM 3-1, Command and Staff Action; FMFM 6-3, Marine Infantry Battalion; and NWP 22-3, Ship-to-Shore Movement, contain detailed discussions of the preparation of these plans. Amphibious vehicle unit liaison personnel assist in the preparation of these plans when their units are to be involved. Among those landing documents of specific interest to the amphibious vehicle units are the following:

a. Landing Diagram.--The landing diagram is the graphic means of illustrating the plan for ship-to-shore movement of the scheduled waves of an assault unit. The landing formation and type of landing craft or vehicles comprising the waves are normally determined by the landing team or unit commander, based on naval capabilities for supporting the plan, including amphibious vehicle capability. Amphibious vehicle waves depicted in the landing diagram portray the boat teams embarked on amphibious vehicles numbered consecutively from left to right in each wave. Each of these vehicles is identified by two numbers: the first indicating the wave; the second, the position of the vehicle in the wave. For example, number 5-5 would be the fifth vehicle from the left in the fifth wave. Figure 1 illustrates an example of a landing diagram.

b. Approach Schedule.--The approach schedule indicates the time of departure from the rendezvous area or ship (if amphibious vehicles are dispatched directly to the line of departure), the line of departure and other control points, and the time of arrival at the beach for each scheduled wave. The time of arrival or departure of a wave is expressed as H-hour plus or minus so many minutes. Amphibious vehicle liaison personnel advise the commander of optimum distances for discharge of their vehicles from the line of departure, average waterborne speeds, and estimated mechanical failures depending on waterborne distance. Figure 2 illustrates the approach schedule. Consult NWP 22-3, Ship-to-Shore Movement, for a more detailed example of the approach schedule.

H-HOUR 0830 Beach RED-1

	ASS'T PLATS COS E AND F									
WAVE 1 H-Hour	1-1 X*	1-2 X	1-3 X	1-4 X	1-5 X	1-6 X	1-7 X	1-8 X	1-9 X	1-10 X
	CO E(-) AND CO F(-)									
WAVE 2 H+4 Min	2-1 X*	2-2 X	2-3 X	2-4 X	2-5 X	2-6 X	2-7 X	2-8 X	2-9 X	2-10 X
	LEADING PLATS CO G(-) AND 81MM MORT PLAT									
WAVE 3 H+8 Min	3-1 X*	3-2 X	3-3 X	3-4 X	3-5 X	3-6 X	3-7 X	3-8 X	3-9 X	3-10 X
	CO G(-)									
WAVE 4 H+12 Min	4-1 X*	4-2 X	4-3 X	4-4 X	4-5 X	4-6 X	4-7 X			
	CO H									
WAVE 5 H+16 Min	5-1 X*	5-2 X	5-3 X	5-4 X	5-5 X	5-6 X	5-7 X	5-8 X	5-9 X	5-10 X
	H&S CO(-)									
WAVE 6 H+20 Min	6-4 O	6-2 O	6-1 O*	6-3 O	6-5 O					

LEGEND: X ... LVTP O ... LCVP
* ... Troop Wave Commander

Figure 1.--Example of a Landing Diagram.

WAVE	LEAVE RENDEZVOUS AREA	LEAVE LINE OF DEPARTURE	LAND
1	H-27 minutes	H-15 minutes	H-hour
2	H-23 minutes	H-11 minutes	H+4 minutes
3	H-19 minutes	H-7 minutes	H+8 minutes
4	H-15 minutes	H-3 minutes	H+12 minutes
5	H-11 minutes	H+1 minute	H+16 minutes
6	H-7 minutes	H+5 minutes	H+20 minutes

Course from rendezvous area to line of departure 040°T, 035° MAG.
Course from line of departure to beach 355°T, 350° MAG.
Boat group commander: Lt WAVE, USN.
Assistant boat group commander: LtJG HATCH, USN.
Primary control officer: LCDR BEAM, USN, Embarked in LPR 89.

Figure 2.--Example of an Approach Schedule.

CRAFT	PERSONNEL	BOAT SPACES	FORMATION
LVTP 1-1	Plat Comdr, 1st Plat, Co E	1	Column
	Msgr, 1st Plat, Co E	1	1-1
	3d Sqd, 1st Plat, Co E	13	x
	Sqd Ldr, 1st MG Sqd, Wpns Plat, Co E	1	1-2
	1st Tm, 1st MG Sqd, Wpns Plat, Co E	4	x
	Corpsman	1	1-3
		21	x
			1-4
LVTP 1-2	Plat Sgt, 1st Plat, Co E	1	x
	Plat Guide, 1st Plat, Co E	1	1-5
	2d Sqd, 1st Plat, Co E	13	x
	2d Tm, 1st MG Sqd, Wpns Plat, Co E	4	1-6
	Corpsman	1	x
		20	1-7
			x
LVTP 1-10	XO, Co F	1	1-10
	Gy Sgt, Co F	1	x
	Plat Sgt, 2d Plat, Co F	1	
	Plat Guide, 2d Plat, Co F	1	
	Msgr, 2d Plat, Co F	1	
	1st Sqd, 2d Plat, Co F	13	
	Corpsman	1	
		19	

Figure 3.--Example of a Landing Craft and Amphibious Vehicle Assignment Table.

c. Landing Craft and Amphibious Vehicle Assignment Table.--The landing craft and amphibious vehicle assignment table shows the organization of troop units into boat teams and the assignment of boat teams to waves or to a serialized element of a nonscheduled unit. It may also include instructions for assignment of floating dump supplies to amphibious vehicles. This table, together with the debarkation schedule, furnishes the ship's commanding officer with information for debarkation of troops. It is prepared by the commanding officer of troops of each ship. Amphibious vehicle liaison personnel advise supported commanders and staffs with respect to vehicle capacity and methods of employment. Figure 3 illustrates a landing craft and amphibious vehicle assignment table.

d. Serial Assignment Table

(1) A serial is a group of troop units, supporting units, and their equipment embarked in the same ship and which, for tactical or logistic reasons, is to be landed on a specified beach at approximately the same time. Amphibious vehicles may be used to transport a serial. A serial number is assigned to each grouping. The serial assignment table shows the following in tabulated form:

(a) Serial number.

(b) Title of the unit.

(c) Approximate number of personnel in the serial.

SERIAL		PERS	MATERIAL EQUIPMENT VEHICLES	LANDING CRAFT NO/TYPE	SHIPS	REMARKS
1426	Ass't Elms, Co E Ass't Plats MG Sqd, Co E Ass't Sqd, Co E Det, Hq Sec, Co E	107 (88) (9) (7) (3)	Normal Combat	5 LVTP7	LST-1179	1st Wave Beach RED 1
1427	Co E (Rein) (-) Res Plat Wpns Plat (-) Det, Co Hq, Co E Det, Med Plat, H&S	108 (44) (50) (7) (7)	Normal Combat	5 LVTP7	LST-1180	2d Wave Beach RED 1
1428	Ass't Elms, Co F Ass't Plats MG Sqd, Co F Ass't Sqd, Co F Det, Co Hq, Co F	107 (88) (9) (7) (3)	Normal Combat	5 LVTP7	LST-1179	1st Wave Beach RED 1

Figure 4.--Example of a Serial Assignment Table.

(d) Material, vehicles, and equipment in the serial.

(e) Number and type of amphibious vehicles or landing craft required to boat the serial.

(f) Ship on which the serial is embarked.

(g) Remarks to include the landing category such as the designated wave, on-call wave, or nonscheduled unit. Such remarks aid in rapid identification and location of the serial by control agencies.

(2) The table is prepared and issued at landing force level. Amphibious vehicle unit personnel advise as to capacities of amphibious vehicles, on problems in regard to locating amphibious vehicle units aboard ships, and the conduct of transfer operations, if planned. Figure 4 illustrates the serial assignment table.

e. Landing Sequence Table.--Detailed plans for the ship-to-shore movement of nonscheduled units are set forth in the landing sequence table. It is used by troop and naval agencies as the principal document in executing and controlling the movement of nonscheduled units. The completed table forms the basis for embarkation and loading plans of the units concerned. The table is prepared at landing force level and applicable portions are extracted by subordinate units. Amphibious vehicle personnel advise as to which vehicle best meets the landing force requirement, where it would be best embarked, and other considerations pertaining to amphibious vehicle employment. The landing sequence table is illustrated in figure 5.

UNIT	ELEMENT	SERIAL NO.	CARRIER NO.	CARRIER TYPE	SHIP	BEACH	REMARKS
Co A(-), 2d Tk Bn	1st Plat Hvy Sec, 2d Plat	905	3	LCU	LSD	RED	
Co A(-), 2d Tk Bn	Lt Sec, 2d Plat 3d Plat Hq Sec	906	3	LCU	LSD	RED	
Co B(-), 2d Tk Bn	1st Plat Hvy Sec, 2d Plat	907	3	LCU	LSD	BLUE	
Co B(-), 2d Tk Bn	Lt Sec, 2d Plat 3d Plat Hq Sec	908	3	LCU	LSD	BLUE	
Co A(-), 2d Engr Spt Bn		105	5	LVTP	LST	RED	

Figure 5.--Example of a Landing Sequence Table.

f. Assault Schedule.--An assault schedule is prepared and issued in order to prescribe the composition and timing of waves landing over designated beaches. The schedule is prepared at landing force level and applicable portions are extracted by subordinate units. The schedule shows the wave number of each scheduled wave, the time of landing or reporting to the line of departure, the types of landing craft or amphibious vehicles involved, the units landing, and their serial numbers. Figure 6 illustrates an assault schedule.

BEACH		RED-1		RED-2	
WAVE	TIME	CRAFT/VEH SERIAL	UNIT	CRAFT/VEH SERIAL	UN
1	H-Hour	10 LVTP7 1426, 1428	Ass't Plats, Co E and Co F		
2	H+4 Min	10 LVTP7 1427, 1428	Co E(-) and Co F(-)		
3	H+8 Min	10 LVTP7 1429	Leading Plats, Co G, 81mm Mort Plat		
4	H+12 Min	7 LVTP7 1431	Co G(-)		
5	H+16 Min	10 LVTP7 1432	Co H		
6	H+20 Min	5 LCVP 1433, 1434	H&S Co(-)		

Figure 6.--Example of an Assault Schedule.

SHIP	AMPHIBIOUS VEHICLE UNIT	NUMBER AND TYPE AMPHIBIOUS VEHICLE		REMARKS
		LVTP7	LVTC7	
LST-1179	1st Plat, Co A, 1st Ass'tAmphBn, FMF	10	1	
	2d Plat, Co A, 2d Ass'tAmphBn, FMF	10	1	
LST-1180	3d Plat, Co A, 2d Ass'tAmphBn, FMF	10		
	Hq Plat, Co A, 2d Ass'tAmphBn, FMF	3	2	Plus 1 LVTR7
LST-1181	4th Plat, Co A, 2d Ass'tAmphBn, FMF	10		
LSD-36	Co B(-), 2d Ass'tAmphBn, FMF	43	2	Plus 1 LVTR7
LPD-4	4th Plat, Co D, 2d Ass'tAmphBn, FMF	10		
	Hq Plat, CoD, 2d Ass'tAmphBn, FMF	3	2	Plus 1 LVTR7
	TOTAL	187	15	6 LVTR7

Figure 7.--Example of an Amphibious Vehicle Availability Table.

g. Amphibious Vehicle Availability Table.--The amphibious vehicle availability table is a tabulation of the type and number of amphibious vehicles which are available to the landing force. The landing force prepares the amphibious vehicle availability table utilizing data derived from consultation with representatives of both the amphibious vehicle unit and the naval command organization responsible for assigning wave guides to amphibious vehicle waves. The table includes the type and number of vehicles embarked in each ship and identifies the amphibious vehicle unit involved. An example of the amphibious vehicle availability table is set forth in figure 7.

h. Amphibious Vehicle Employment Plan.--The amphibious vehicle employment plan shows, in tabular form, the contemplated employment of amphibious vehicles, including their employment after landing. The commander landing force prepares the amphibious vehicle employment plan when shipping availability is confirmed and after the assault schedule is completed. Amphibious vehicle unit liaison personnel are vitally involved in the completion of the document, which controls their employment. The plan includes identification of ships in which all vehicles are embarked, number and type of amphibious vehicles employed, wave in which the vehicles will land, and destination of all vehicles. An example of the amphibious vehicle employment plan is illustrated in figure 8.

1205. SHIPPING CONSIDERATIONS

Amphibious vehicles are embarked aboard and transported to the objective area by ships of the amphibious fleet. Landing ships are normally employed for this mission. Other ships of the amphibious fleet, such as the LKA and LPA, possess some capability for lifting amphibious vehicles, but are limited by unwieldly loading procedures and low-carrying capacity.

a. Landing Ships.--The landing ships normally employed to transport amphibious vehicles are the dock landing ship (LSD), tank landing ship (LST), amphibious transport dock (LPD), and the general purpose amphibious assault ship (LHA). These ships are best suited for transporting amphibious vehicles for the following reasons:

ORIGIN	NUMBER AND TYPE AMPHIBIOUS VEHICLES		WAVE	DESTINATION	REMARKS
	LVTP7	LVTC7			
LST-1179 LST-1179	10		1	Beach RED-1	Ass't Plats, Co E, BLT 2/6 Ass't Plats, Co F, BLT 2/6
LSD-36 LSD-37	5 5		1	Beach RED-2	Ass't Plats, Co A, BLT 1/6 Ass't Plats, Co B, BLT 1/6
LST-1179 LST-1179	10	1	2	Beach RED-1	Co E(-), BLT 2/6 Co F(-), BLT 2/6
LSD-36 LSD-37	5 5		2	Beach RED-2	Co A(-), BLT 1/6 Co B(-), BLT 1/6
LST-1179	10		3	Beach RED-1	Co G, BLT 2/6
LSD-37	10	1	3	Beach RED-2	Co C, BLT 1/6
LSD-37	5			Floating Dump Primary Control Vessel RED	RLT-2 prescribes load

Figure 8.--Example of Amphibious Vehicle Employment Plan.

(1) They allow for more rapid loading and unloading.

(2) Embarked vehicles are readily accessible for en route service and preparation.

(3) Vehicles can be launched near the line of departure, decreasing the amount of time they spend in the water.

(4) Troops may be loaded aboard amphibious vehicles before they are launched.

b. Ship's Characteristics.--Ships of the amphibious fleet have varying internal characteristics which affect their amphibious vehicle carrying capacity. Details concerning each ship are found in that ship's characteristics pamphlet. Prior to planning the load for any ship, its characteristics pamphlet is consulted to determine its true carrying capacity for each type of amphibious vehicle involved. Personal liaison between amphibious vehicle unit personnel and the ship should be employed when practicable to ensure maximum coordination and cooperation. Appendix J lists amphibious vehicle carrying capacities for certain classes of landing ships. These are estimates and are offered only as examples since individual ship's carrying capacities vary greatly. The LSD's, LPD's, and LHA's are the only operational ships that have the flexibility to launch the amphibious vehicles at speeds and in a manner consistent with current concepts contained in NWP 22-3, Ship-to-Shore Movement. The underway launch capability of the 1179 class LST is limited to speeds of 6 knots or less.

1206. EMBARKATION OF AMPHIBIOUS VEHICLES

a. Preparation for Embarkation.--Representatives of amphibious vehicle units attend planning conferences at appropriate landing force and naval echelons. They advise commanders on shipping requirements, and recommend methods of embarking and employing their units. Resulting decisions appear as tables, showing the types and number of amphibious vehicles to be carried by ships of the transport group. These tables are described in paragraph 1204 and in FMFM 4-2, Amphibious Embarkation.

b. Embarkation Plans.--Plans for the embarkation of amphibious vehicles are completed prior to arrival of assault shipping. Items peculiar to amphibious vehicle units include:

(1) Embarkation of vehicles and crews.

(2) Embarkation of command, maintenance, and communication personnel as required to support vehicle commitments.

(3) Loading of supplies and equipment such as fuel and repair parts to support embarked vehicles.

(4) Staffing and equipping ships designated as amphibious vehicle repair ships.

(5) Preloading supported unit's vehicles and cargo.

c. Loading of Amphibious Vehicles.--Details with regard to loading amphibious vehicles aboard the various types of landing ships are included in the chapter describing that vehicle. For further details with regard to general considerations affecting embarkation of amphibious vehicles, see FMFM 4-2, Amphibious Embarkation.

d. Embarkation of Personnel Aboard Amphibious Vehicles.--The embarkation of personnel aboard amphibious vehicles is discussed in paragraphs 1204 and 1308. This discussion includes planning responsibilities and preparation of related documents.

1207. REHEARSAL PREPARATORY TO OPERATIONS

A rehearsal is defined as that phase of an amphibious operation in which one or more exercises are conducted by the amphibious task force, or elements thereof, under conditions approximating those of the contemplated amphibious operation. It is executed in accordance with a plan which parallels the plan for the specific operation, and its participants should include all units which are to take part in the amphibious operation.

a. Purpose of Rehearsals.--Rehearsals are scheduled in order to test:

(1) Adequacy of plans and familiarity of all participants with them.

(2) The timing of detailed operations such as transfer operations and debarkation of vehicles.

(3) Adequacy and clarity of the control system.

(4) Adequacy of communications and communication plans.

(5) Combat readiness of the force.

(6) Effectiveness of liaison. Liaison is a very big factor to a successful landing. It is pertinent for the wave guide and wave commander

to have the same arm-and-hand signals. They should go over them prior to a rehearsal and landing. Also, the troop commander and LVT platoon leader should discuss vehicle loading and decide on which flank the troop commander wants the first (lead) LVT.

b. Amphibious Vehicle Considerations.--When rehearsals are scheduled after vehicles have been embarked for the operation, the following factors affecting amphibious vehicles are considered:

(1) Delay involved in reembarking and refueling vehicles aboard landing ships.

(2) Necessary replacements of vehicles lost or damaged beyond repair during rehearsal.

(3) Additional requirement for fuel, repair parts, and other related supplies.

1208. MOVEMENT TO THE OBJECTIVE AREA

Amphibious vehicle unit personnel are responsible for maintenance and preparation of their vehicles for landing while moving to the objective. This responsibility is in addition to troop orientation, weapons firing, and other preparations standard throughout the landing force. Appendix K outlines the duties of amphibious vehicle crews prior to waterborne operations.

a. Briefing.--Amphibious vehicle personnel are briefed on the operation as are all personnel within the landing force. They receive special briefing in the areas of beach condition, hydrography of the objective area, condition of inland terrain and roads, location of beach exits, and enemy defenses. (See par. 1203.)

b. Vehicle Preparation.--During movement to the objective area, final maintenance checks and required servicing of vehicles are accomplished. These inspections include as a minimum:

(1) Preoperational checks to include checking each vehicle for complete watertight integrity.

(2) Recharge of batteries when required. Ship's equipment may be used for recharging.

(3) Regular operation of engines to ensure their efficient state of maintenance. Under most conditions, 20-minute operation three times each week should be satisfactory. To preclude asphyxiation, all ship's blowers should be operating at maximum capacity while engines are operating. Engine operation will be conducted only with the specific permission and under the supervision of the commanding officer of the ship or his representative.

(4) Communication system and crew member helmets should be checked. Although the steel from the ship hinders the use of radios and the communication system, it is still feasible and pertinent to check the intercom and ensure that the helmets function properly.

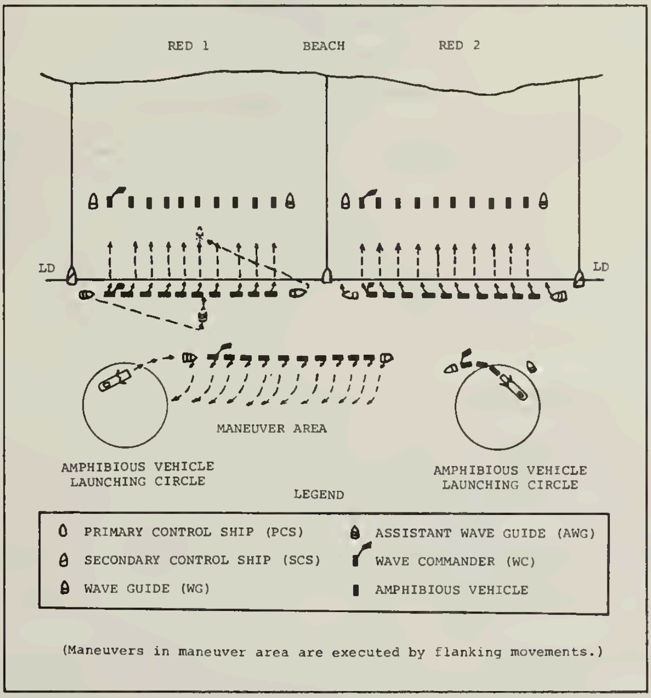
Section III. FUNDAMENTALS OF THE SHIP-TO-SHORE MOVEMENT

1301. GENERAL

The commander amphibious task force (CATF) accomplishes the movement of the landing force from transport ships in the objective area to the hostile shore through naval elements of the amphibious task force. Landing ships, helicopters, landing craft, and amphibious vehicles are employed in accomplishing this mission. The waterborne patterns of ship-to-shore movement of amphibious vehicles are similar to those of landing craft. Amphibious vehicles possess the inherent ability to continue across the beach to inland points. These vehicles, however, have a slower water speed than landing craft. Employment of the high speed launch technique from LSD's, LPD's, and LHA's, and the underway launch from the 1170 class LST's, eliminates the need for movement to the line of departure, reduces the time assault troops are required to be embarked in LVT's, reduces the time ships are exposed to hostile fire, and eliminates the need for rendezvous circles.

1302. SEA AREAS

The designation and organization of sea areas are accomplished by the CATF. These areas are designed to provide control measures for landing craft and amphibious vehicles, as well as station and maneuver areas for various naval control groups. Certain of these sea areas are illustrated in figures 9 and 10. Sea areas of concern to amphibious vehicle units in the ship-to-shore movement include the following:


RED 1
BEACH
RED 2
LD
LD
MANEUVER AREA
AMPHIBIOUS VEHICLE LAUNCHING CIRCLE
AMPHIBIOUS VEHICLE LAUNCHING CIRCLE
LEGEND
PRIMARY CONTROL SHIP (PCS)
SECONDARY CONTROL SHIP (SCS)
WAVE GUIDE (WG)
ASSISTANT WAVE GUIDE (AWG)
WAVE COMMANDER (WC)
AMPHIBIOUS VEHICLE

(Maneuvers in maneuver area are executed by flanking movements.)

Figure 9.--Example of Debarkation, Maneuvering, and Movement Across the Line of Departure.

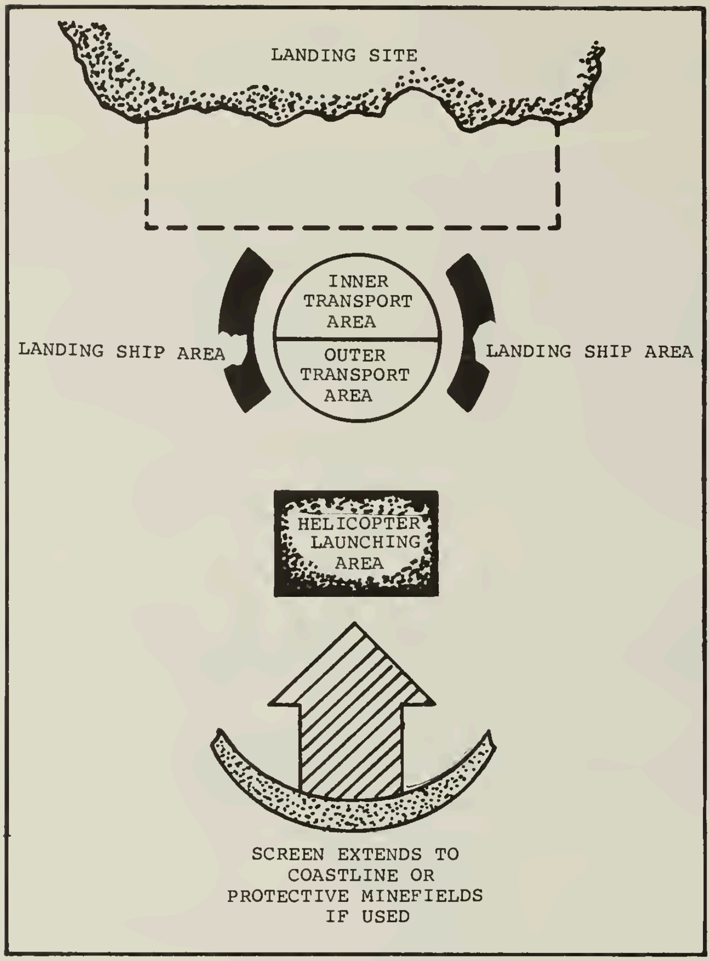


Figure 10.--Sea Areas and Positions Off Landing Beaches.

a. Boat lanes.

b. Transfer areas (lines).

c. Lines of departure.

d. Approach lanes.

e. Amphibious vehicle launching areas.

f. Assembly and rendezvous areas.

g. Landing ship areas.

h. Transport areas.

i. Fire support areas immediately adjacent to boat lanes.

1303. NAVAL CONTROL GROUP

The mission of the naval control group is to direct, supervise, and control the landing craft and amphibious vehicles in the waterborne ship-to-shore movement. The organization of the control group is based upon the arrangement and number of beaches on which the troops are to be landed. Composition of the group normally includes the following officers:

a. Central Control Officer.--The central control officer, under the CATF, is in direct charge of the movement of the scheduled waves to the beach. After the landing of the scheduled waves, he coordinates the movement of all waterborne transportation to and from the beach throughout the remainder of the landing and the unloading. Coordination of control efforts is accomplished through the assistant central control officers and primary control officers.

b. Assistant Central Control Officers.--An officer designated as the assistant central control officer is assigned for each transport organization when two or more divisions are landed simultaneously or when the amphibious operation includes separate landings dispersed to the point where central control is impractical. These officers are embarked in an appropriate ship or craft and coordinate the movement of landing craft, amphibious vehicles, and landing ships to their respective beaches.

c. Primary Control Officer.--A primary control officer is designated for each transport organization landing an assault regimental landing team (RLT). These officers, embarked in primary control ships, control the movement of landing craft, amphibious vehicles, and landing ships to and from the battalion landing team (BLT) beaches. When assault BLT's are to be landed over widely separated beaches, additional primary control officers may be required for each BLT beach.

d. Secondary Control Officers.--Secondary control officers, embarked in separate ships, are stationed on the line of departure to assist the primary control officers. They are usually stationed so that they mark the flank of the boat lanes at the line of departure.

e. Approach Lane Control Officers.--Embarked in approach lane marker ships, these officers are normally stationed at the seaward end of the approach lanes. They control the movement of the waves between approach lane marker ships and the line of departure.

1304. CONTROL OF AMPHIBIOUS VEHICLES

The techniques utilized in controlling landing craft are generally applicable to amphibious vehicles. Except when the high speed launch technique is employed, amphibious vehicles require additional control measures during the ship-to-shore movement because of their slower water speed, limitations of maneuverability, and reduced visibility from within while afloat. Principally concerned with movement of amphibious vehicles during at-anchor launches are boat group commanders, wave guide officers and their assistants, and wave commanders.

a. Boat Group Commanders.--The basic unit employed by the Navy for control of amphibious vehicles and landing craft afloat is the boat group. The Navy assigns an officer to each boat group as its commander, and provides him with an assistant if required. Amphibious vehicles en route to the beach, and once retracted from the beach, are controlled by their boat group commander. A boat group comprises sufficient craft and/or vehicles to lift one unit, normally a BLT. During the movement from ship to shore, boat groups are organized into waves. A wave consists of amphibious vehicles or landing craft scheduled to land simultaneously.

b. Wave Guide Officers.--Wave guide officers are responsible for:

(1) Forming up the amphibious vehicles and guiding them to a position seaward of the line of departure (LOD).

(2) Reporting to the primary control ship, giving any details affecting the readiness of his wave.

(3) Taking station ahead of the wave and his assistant astern of the wave when the wave is in a column or wedge and taking a position on the left flank with his assistant on the right flank when the wave is on line during an amphibious assault.

(4) Ensuring that his wave is maintaining proper position in the boat lane and reaches the proper beach on time. He is assisted by directions from the primary control ship.

(5) Guiding his wave to the first line of breakers, where the wave guide boats take station and return to seaward after the vehicles have landed. If vehicles do not return to seaward, the guide boats normally report to the primary control ship.

c. Wave Commanders.--The senior amphibious vehicle officer or NCO in each wave is designated wave commander. He takes a position in the wave which best enables him to exercise command. Wave commander's responsibilities include:

(1) Maneuver of amphibious vehicles and maintenance of their formation within the wave.

(2) Fire control of LVT's during ship-to-shore phase.

(3) Tactical movement of amphibious vehicles inshore of the limits of navigation (once the wave guide retires).

(4) Retraction of amphibious vehicles from the beach.

d. Means of Control.--Appendixes L and T contain illustrations of flags, lights, markers, and arm-and-hand signals used in the control of amphibious vehicles in the ship-to-shore movement.

1305. LIAISON DURING LANDING OPERATIONS

It is the responsibility of the Navy to ensure the landing of waves on assigned beaches at the scheduled times. Liaison personnel from the landing force assist in accomplishing this mission through tactical-logistical (TAC-LOG) groups. Operating from control ships, these liaison groups furnish advice to naval control officers in matters pertaining to the landing force. Amphibious vehicle personnel included in TAC-LOG groups advise on employment of the vehicles. TAC-LOG groups must be prepared to furnish their own means of communications with their parent organization, employing tactical communication equipment. In addition to TAC-LOG, amphibious vehicle liaison personnel may be assigned to boat group commanders and wave guides for assistance, as well as to units being lifted. Positive liaison must, however, be established between wave guides and wave commanders.

1306. AMPHIBIOUS VEHICLE IDENTIFICATION

Amphibious vehicles are always identified as to unit designation. During the conduct of amphibious operations, vehicles may also be identified as to boat group, wave, and destination, in order to facilitate their control.

a. Vehicle Markings.--All four sides of amphibious vehicles are lettered in order to designate their company, platoon, and vehicle number as appropriate. Embarked unit designations and/or color beach destinations may be marked on the vehicle after leaving the port of embarkation, as required. Embarked units are normally identified by chalking on the appropriate unit designation. Colored beach destinations may be indicated by use of vertical stripes, corresponding in color and number to the beach on which the vehicle is to land.

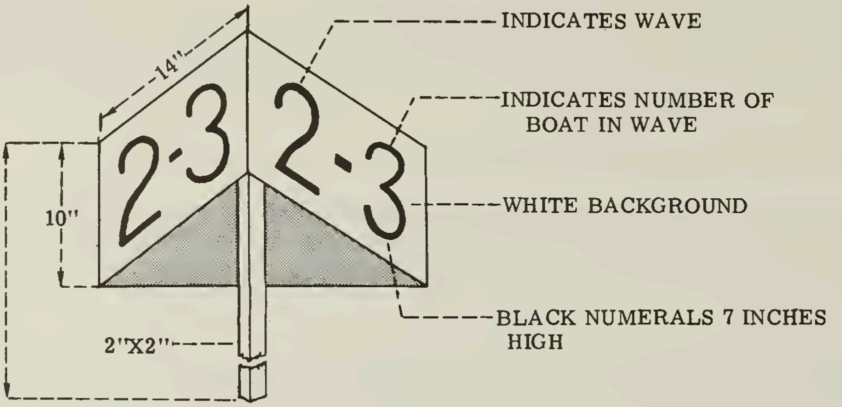
b. Boat Paddles.--Waves of landing craft are identified by boat paddles with painted numerals indicating the number of the wave and the position of each boat within the wave. Boat paddles are constructed by embarked units. Boat team commanders ensure that paddles are displayed until the line of departure is crossed. Boat paddle design and dimensions are illustrated in figure 11.

c. Turret Marking.--LVT's are identified by marking the port and starboard sides of the turret in lieu of boat paddles. Information displayed would be the same as on a boat paddle.

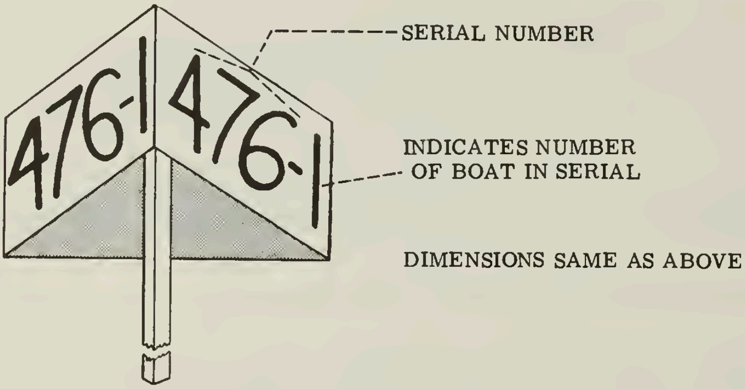
1307. DEBARKATION OF AMPHIBIOUS VEHICLES

a. Debarkation Time Schedules.--The time for launching amphibious vehicles is determined by the naval control group in conjunction with amphibious vehicle unit representatives. Allowances are made for forming waves, timely crossing of the line of departure, and coordinated movement to the beach. An average waterborne speed of 6 miles per hour is normally used for amphibious vehicles. Troop commanders aboard each ship ensure the vehicles are loaded in accordance with amphibious vehicle assignment tables, in order that debarkation schedules may be met. The preparation of these tables is discussed in paragraph 1204. The troop commander and LVT platoon leader should get together ahead of time and discuss the loading procedure. Points to emphasize would be the order in which vehicles will leave the ship, on which flank the troop commander wants the lead vehicle, and how the troop commander wants to load the vehicles. The troop commander should have a rehearsal of loading his men and equipment into the amphibious vehicle. This will give everyone an idea where their loading stations and vehicles are located and how to get to them. The LVT platoon leader should have in advance a diagram showing loading stations and positions of his vehicles. It should be noted that most rehearsals are done during ideal conditions and troop commanders should consider loading in complete darkness and under extreme conditions.

b. Preparation for Debarkation.--The command to "MAN VEHICLES" is given over the ship's loudspeaker system. Boat teams with their equipment


14"
10"
2"X2"
2-3
2-3
INDICATES WAVE
INDICATES NUMBER OF BOAT IN WAVE
WHITE BACKGROUND
BLACK NUMERALS 7 INCHES HIGH

BOAT PADDLE USED BY BOAT TEAMS IN SCHEDULED WAVES



BOAT PADDLE USED BY BOAT TEAMS IN ON-CALL AND NON SCHEDULED WAVES

Figure 11.--Examples of Boat Paddles.

embark in assigned vehicles. Each boat team commander then ensures that personnel and equipment are in place, that life jackets are worn, and that individual equipment is worn so that it can be jettisoned quickly in the event of an emergency. See section VII, this chapter, for a complete review of safety precautions for personnel embarked in amphibious vehicles during training operations.

c. Launching Amphibious Vehicles.--Prior to launching, all ports and hatches of amphibious vehicles are closed and proper prewater operational checks held. Upon completion of operational checks and on signal from the ship's officer at the head of the ramp, vehicles are driven forward in low gear. Designated personnel guide each vehicle onto the ramp by use of arm-and-hand signals. (See app. L.) As each vehicle starts down the ramp, another is driven forward, ready to follow. Vehicles descend slowly and, when waterborne, quickly clear the ramp area and take position in the prescribed wave. The LVT platoon leader is responsible for knowing what crewmen, maintenance men, communication men, and corpsmen are assigned to and riding in each of his vehicles. Positive measures must be taken to ensure that all personnel are accounted for properly. A list must be made up with vehicle number and names of personnel, rank, and serial number. This list is to be left aboard the ship for proper accountability. The troop commander should have a list of his personnel and to what vehicle they are assigned. The troop commander appoints a boat team commander, and this man's job is to ensure that all personnel are aboard the assigned vehicle. After a proper check, he should give the vehicle crew chief a list of names of all embarked personnel with their vehicle number, name, rank, and serial number. This list should already be prepared, and any last-minute changes can be marked in by hand. The crew chief will then add the names of all amphibious vehicle personnel on that vehicle, and after ensuring that the list is complete, will turn it over along with that vehicle's prewater operation checks to the LVT officer in charge. He, in turn, will deliver the personnel manifests to the ship's first lieutenant or his designated representative who is remaining on the ship. In case of an accident, a designated person will be available with the manifests to ensure all personnel are accounted for.

d. High Speed Underway Launch of LVT's From LHA/LSD/LPD.--The steadily increasing capabilities of weaponry may dictate that amphibious landings of the future be conducted at extended sea distances from beachheads. Although landing craft and amphibious vehicles of the future may be fast enough and seaworthy enough to operate at acceptable distances from beaches, present day amphibious vehicles are not. For this reason, it is highly desirable to deliver LVT's close to the beach, launch them rapidly, and have the transport ships depart the beach area as quickly as possible. The high speed underway launch of amphibious vehicles effects the rapid introduction of assault troops into an area by surface means. This technique has the potential of tactical surprise in amphibious assault since static positioning of a primary control ship and secondary control ships are not required prior to a high speed underway launch of LVT's. Even though the launch position of the LVT's need not coincide with the LOD, the wave must cross the LOD at the prescribed time. Employment of the high speed underway launch technique eliminates the requirement to utilize boat group commanders and wave guide officers. Control of the amphibious vehicles becomes the responsibility of the wave commander, the senior amphibious vehicle officer or NCO of each wave. The wave commander performs those duties normally assigned the wave guides in the ship-to-shore movement. Control and coordination of the wave by the wave commander is accomplished by communications between the wave commander over internal radios to the central control officers in the combat information center (CIC) under the CATF. The wave commander maintains proper speed of advance as determined from radar plot. Proper heading is accomplished by using the remote magnetic heading system (RMHS) in conjunction with radar direction headings plotted by the control ship. The RMHS is integral to all LVTP7 family vehicles. It is a compass system which detects vehicle magnetic heading and displays the information to the operator of the amphibious vehicle. Further, the speed of the launch ship approach and the low silhouette of the LVT reduce advance warning to the opposition. Since the ship retires to seaward immediately after launching, this tactic has the additional advantage of minimizing the vulnerability of the ship to shore-based fire.

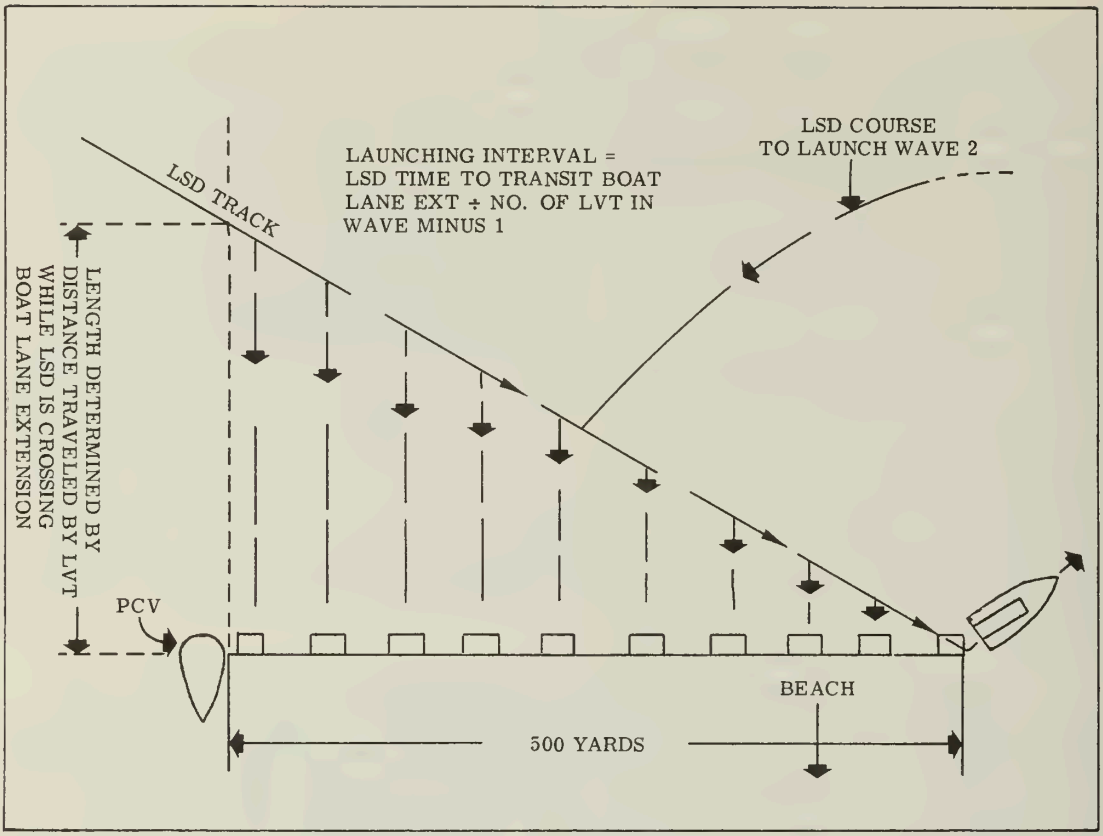

LSD TRACK
LAUNCHING INTERVAL = LSD TIME TO TRANSIT BOAT LANE EXT ÷ NO. OF LVT IN WAVE MINUS 1
LSD COURSE TO LAUNCH WAVE 2
LENGTH DETERMINED BY DISTANCE TRAVELED BY LVT WHILE LSD IS CROSSING BOAT LANE EXTENSION
PCV
BEACH
500 YARDS

Figure 12.--Underway Launch of LVT's From LSD.

e. Procedures for LVT Launch

(1) The track of the landing ships and the timing of the launch must be coordinated with other naval activities participating in the amphibious assault to preclude mutual interference. See figure 12 for a diagram of an underway launch from an LSD.

(2) The launch position of the LVT will be as close to the beach as is hydrographically possible and need not coincide with the LOD.

(3) The precision of the launch in time and space is critical since it determines the precision of the landing and, ultimately, the effectiveness of the landing.

(4) The optimum depth of water over the sill is 6 inches to 1 foot. Water depths in excess of 1 foot slow the LVT's, and depths sufficient to float them could result in loss of control of the LVT's.

(5) The ramp of the ship should not deviate from the horizontal by more than 3 degrees (i.e., 0 to 3 degrees maximum depression of ramp). WARNING: Further depression may cause such turbulance that the LVT will be unable to escape from the wake of the ship.

(6) The launching ship's speed should be the maximum feasible; speeds in excess of 20 knots have been used in executing underway LVT launches.

(7) LVT's should be positioned as far forward in the well as possible to allow for maximum acceleration in order to obtain maximum speed for crossing the sill and becoming waterborne; the higher the LVT speed, the safer and easier the launch.

(8) All LVT hatches are closed until the vehicle is fully waterborne.

(9) Minimum interval between LVT launches is 5 seconds. Larger intervals are considered proper at launch ship speeds of less than 10 knots to provide sufficient distance for safety between LVT's in the water after launch. When launched in pairs, LVT's make an immediate outboard turn when waterborne. Upon clearing the ship's wake, the LVT's make an inboard turn and resume the original course.

(10) LVT's may be launched singly by all LSD/LPD types or in pairs (side-by-side) from LHA's, LPD's, and Thomaston class LSD's.

(11) The amphibious vehicles can be vectored ashore using the RMHS to follow headings from a ship using radar.

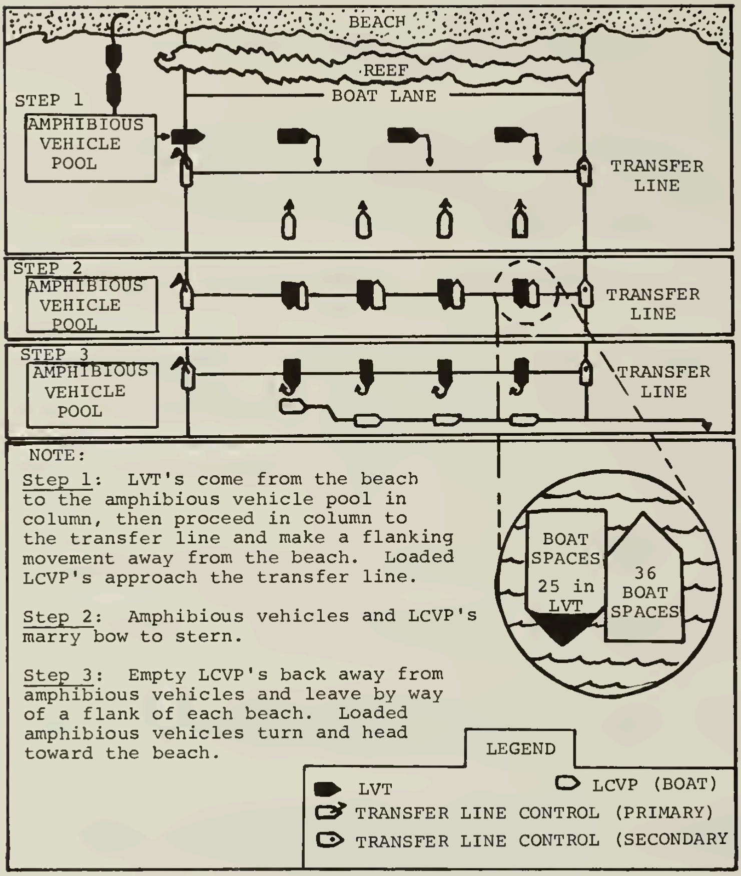
(12) A screening DD/DE for the launching ship can provide the required safety and guide boats for peacetime operations, and helicopters may be used for control purposes.

f. Underway Launch of LVT From the 1179 Class LST.--The 1179 or Newport class LST has incorporated a sterngate which makes it possible for the first time for the LST to launch the LVT while underway. The tactics employed are basically the same as for the LSD/LPD. However, due to the construction of the sterngate and the width of the opening, launch speed must be limited to 6 knots, and LVT's must be launched singly.

1308. CONDUCT OF TRANSFER OPERATIONS

Ships utilized to transport amphibious vehicles to the objective area often cannot accommodate the personnel to be embarked in amphibious vehicles for movement from ship to shore. Generally, amphibious vehicles are not considered suited to embarking personnel directly from typical troop-carrying ships such as the amphibious transport ship (LPA) because of the distance at which they anchor from the shore and the slow water speed of tracked amphibious vehicles. Landing craft, although more maneuverable and faster, are limited when a requirement exists for crossing reefs, sandbars, and offshore obstacles in order to reach the beach, or to continue across the beach. As a result of these considerations, and to fully exploit the capabilities of landing means available to the force, transfer of troops and their equipment from LPA's to landing ships prior to launching amphibious vehicles is often conducted. In some instances, transfer operations from landing craft to launched amphibious vehicles are conducted. Both prior and subsequent methods of transfer are discussed below. See figure 13 for an illustration of a transfer from landing craft to amphibious vehicles.

a. Transfer Prior to Debarkation of Amphibious Vehicles.--The transfer of troops from transport ships to landing ships carrying amphibious



NOTE:

Step 1: LVT's come from the beach to the amphibious vehicle pool in column, then proceed in column to the transfer line and make a flanking movement away from the beach. Loaded LCVP's approach the transfer line.

Step 2: Amphibious vehicles and LCVP's marry bow to stern.

Step 3: Empty LCVP's back away from amphibious vehicles and leave by way of a flank of each beach. Loaded amphibious vehicles turn and head toward the beach.

Figure 13.--Schematic Diagram of Transfer Operations.

vehicles can be accomplished either by means of helicopter or landing craft. Transfer prior to debarkation of amphibious vehicles is the simplest, least hazardous, and most desirable method of executing transfer.

(1) Transfer From Transport Ship to Amphibious Vehicles.--The transfer of troops directly from transport ships to amphibious vehicles is utilized only if no other course of action is available for the reasons set forth above.

(2) Transfer From Landing Craft to Amphibious Vehicles.--Transfer from landing craft to amphibious vehicle is a hazardous operation and must be conducted during an excellent sea state and only when necessary. When this method of transfer is utilized, a transfer area (line) is established seaward of the limits of safe navigation for landing craft and out of the range of enemy small arms fire. (See fig. 13.) In this area, troops and cargo are transferred from landing craft to amphibious vehicles for the trip to the beach. The additional time required for completion of transfer operations is compensated for by the ability of the amphibious vehicles to negotiate the beach and proceed inland. Beach congestion is reduced materially when amphibious vehicles are utilized for the landing of troops.

(a) Control Within the Transfer Area.--The naval control organization is responsible for the conduct of transfer operations. The control ship for the beach concerned takes station near the transfer area as soon as transfer operations begin. The amphibious vehicle units, as well as the lifted troop units, are represented in the control by liaison personnel. (See par. 1305.) Wave guide control craft maintain station along amphibious vehicle routes helping drivers maintain course, assisting in the rescue of personnel from disabled vehicles, and assisting in traffic control.

(b) Conduct of Transfer Operations.--The transfer operation is conducted as follows:

1 All amphibious vehicles report to a designated amphibious vehicle pool officer.

2 As a boat wave approaches the transfer area, the control officer requests the amphibious vehicle pool officer to dispatch the required number of amphibious vehicles to the transfer area.

3 Vehicles approach the transfer area in a column parallel to a designated line. When properly spaced in a column, they turn to seaward, and lie-to in a direction likely to cause the least motion. Amphibious vehicles do not maneuver during the approach by landing craft.

4 Landing craft waves approach the transfer area in line abreast. Each craft "marries" to the lee side of the designated amphibious vehicle, bow to stern.

5 Fenders are then placed between vehicle and craft, and the two are lashed together. Necessary maneuvers are powered by the landing craft, and the amphibious vehicle tracks remain disengaged during this phase of the transfer operation.

6 Troops step from the gunwales of the landing craft to the deck of the amphibious vehicle and descend into the cargo and personnel compartment of the vehicle.

7 Heavy equipment is passed from the landing craft to personnel who have already transferred.

8 Cargo loads are transferred by personnel stationed in the transfer area for this purpose. Roller conveyors between craft and vehicle may be used for this purpose. During latter stages, barges and floating cranes are used to speed cargo transfer operations. (See par. 2309.)

9 Landing craft are loaded so as to facilitate transfer of embarked personnel. A landing craft may carry several normal loads for amphibious vehicles. Loads for more than one destination are avoided.

10 Once transfer is accomplished, landing craft proceed via the nearest flank of the appropriate boat lane to designated ships or control points for further employment. Amphibious vehicles proceed as directed by the transfer area control officer or wave guide.

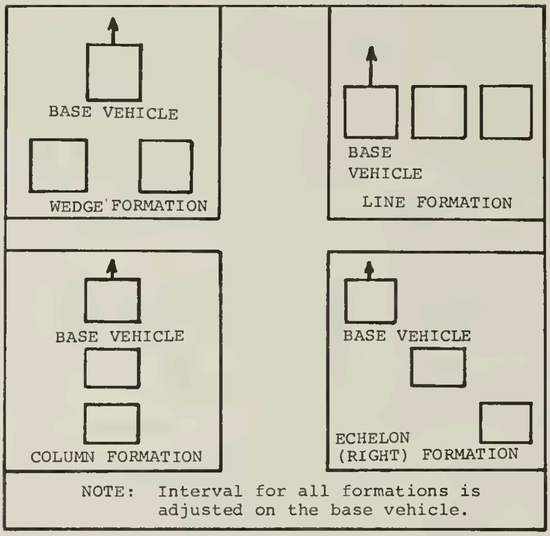


Figure 14.--Illustration of Amphibious Vehicle Formations.

1309. FORMATION OF WAVES FOR AT-ANCHOR LAUNCHES

After debarkation, amphibious vehicles form in designated waves with the assistance of their respective guide boats. The optimum interval between vehicles for ease of control is three vehicle lengths. Other factors influencing interval between vehicles are the formation and interval required upon reaching the beach, sea conditions, and visibility. When formed in column, each wave follows its guide boat toward the line of departure and, by turning, forms a line seaward and parallel to the line of departure. Figure 14 illustrates the various formations used by amphibious vehicle units.

1310. MANEUVER AT THE LINE OF DEPARTURE

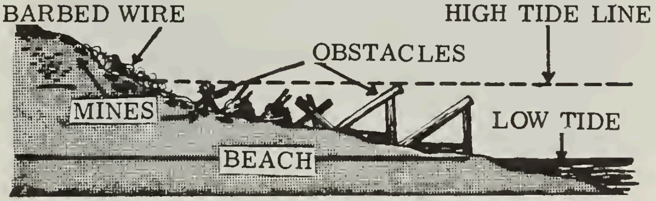
Waves arriving at the line of departure are directed by the primary control officer. (See fig. 9.) Waves arriving prior to scheduled crossing time maneuver to maintain wave integrity. Vehicles maneuver by a series of flanking movements, protecting against wave inversion and excessive wear on steering mechanisms. Maneuvers are conducted at slow speed, while wave guides watch for signals from the control ship in order to ensure timely crossing of the line of departure.

1311. CROSSING THE LINE OF DEPARTURE

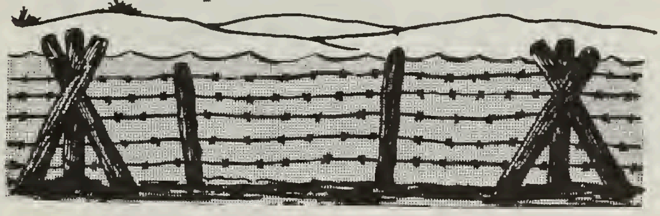
The primary control officer orders waves across the line of departure by use of a flag hoist and supplemental voice radio. Five minutes before the first wave is to cross, the control ship hoists a "numeral one" flag at the dip (half-mast). The first wave then moves into position immediately seaward of the line of departure. Two minutes before crossing, the flag is hauled to the "close-up" position (all the way up), and vehicles move toward the line of departure. When the flag is hauled down, the wave crosses the line of departure and proceeds to the designated beach. For all succeeding waves, only the 2-minute warning and the execute signals described above are given, using the numeral flag corresponding to the wave number being dispatched. (See app. T.)

1312. MOVEMENT TO THE BEACH

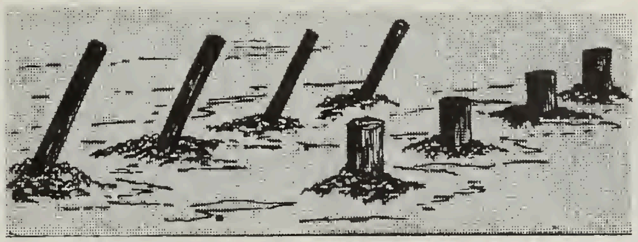
En route to the beach, landing craft designated as guide boats take position at the flanks or to the front and rear of assigned waves, as appropriate. (See subpar. 1304b.) The wave commander maintains interval between vehicles within the wave and adjusts speed to that of the wave guide. The last 1,000 yards to the beach are covered at the fastest speed commensurate with combat efficiency. All vehicle hatches are closed as protection against enemy action and shell burst. Just prior to entering the surf zone, guide boats leave the wave, and the amphibious vehicles then continue inland in accordance with predetermined plans or return to seaward after discharging troops or cargo. Vehicles returning seaward will enter the water from the flanks of the beach to avoid interference with subsequent waves.



Obstacles in beach defenses. Obstacles shown include hedgehogs, horned scullies, and log post obstacles. Combining a series of obstacles into a barrier increases the effectiveness of the defense system.



Wire fence employed as an underwater obstacle.

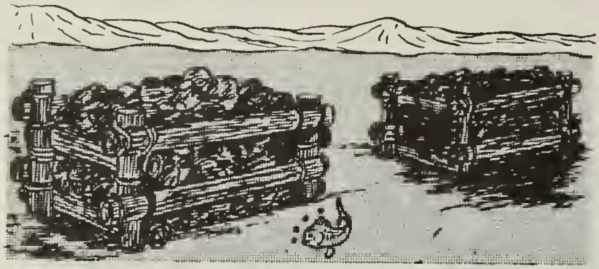


Underwater posts. Their effectiveness as obstacles is increased by attaching antitank mines. They are spaced about 5 feet apart.

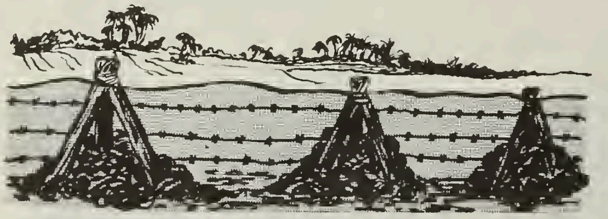
Figure 15.--Examples of Obstacles Emplaced to Limit Amphibious Vehicle Operations on the Beach and Seaward of the Beach.

1313. UNDERWATER AND BEACH OBSTACLES

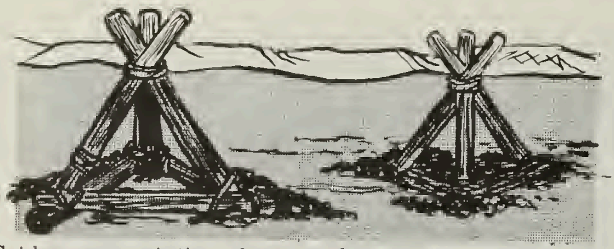
a. Underwater Obstacles.--Underwater obstacles are effective against all types of amphibious vehicles and must be cleared before landing operations commence. If only narrow passages are cleared, amphibious vehicle formations are adjusted so the cleared channel is traversed by all vehicles. Landing and retraction by subsequent waves is coordinated at each cleared passage to prevent congestion until additional passages are cleared. The landing rate is slowed to allow for decreased speed in reaching the beach and unloading. Figures 15 through 17 illustrate some of the underwater obstacles that may be employed against amphibious vehicles.



Rock-filled log cribs are effective obstacles. Antitank mines attached to the seaward side increase their effectiveness. They are spaced about 5 feet apart and are about 10 feet long and 4 feet wide.



Rock-filled tetrahedra, joined by barbed wire fence. Attaching mines increases the effectiveness of the obstacle.

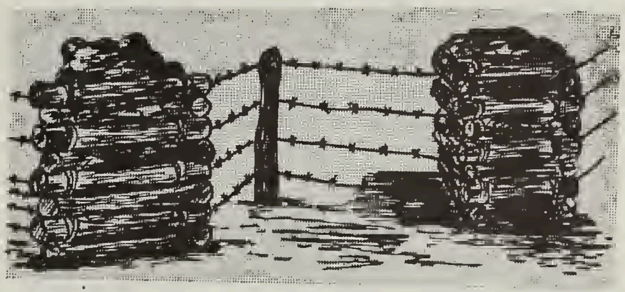


Spiders, a variation of tetrahedra, are made of logs braced by crossmembers at the base and weighted with rocks or with ends buried in the sand. They may be incorporated in wire fences. They are spaced 15 to 30 feet apart.

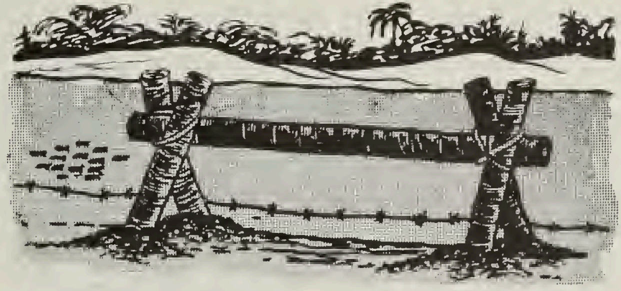
Figure 16.--Examples of Underwater Obstacles Emplaced to Limit Amphibious Vehicle Operations.

b. Beach Obstacles.--Manmade or natural obstacles encountered inland of the high water mark can restrict amphibious vehicle movement. Beach minefields are neutralized before landing scheduled waves.

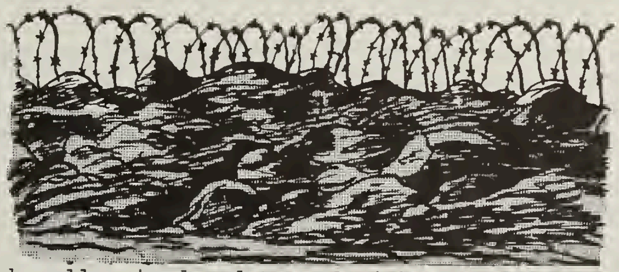
c. Eliminating Obstacles.--Instructions regarding elimination of underwater and beach obstacles are contained in NWP 22-4, Underwater Demolition Teams in Amphibious Operations, and FMFM 4-4, Engineer Operations.



Rock-filled pillars joined by barbed wire fencing are effective obstacles. Pillars are triangular, about 6 feet in height and 7 to 9 feet across one side.



Log barricades. They are spaced at intervals of 6 to 10 feet and may be strung with wire.



Rock wall, mined and topped with concertina, is an effective obstacle against boats, tanks, amphibious craft, and troops. Wall is about 4 feet in height.

Figure 17.--Examples of Obstacles Emplaced to Limit Amphibious Vehicle Operations on the Beach and Seaward of the Beach.

1314. AMPHIBIOUS VEHICLES AS MOBILE AND FLOATING DUMPS

a. Mobile Dumps.--LVT's may be employed in support of a mobile force ashore, normally a BLT, as mobile dumps. These vehicles are loaded as directed by the supported unit commander. Their loads may include personnel, crew-served weapons, ammunition, rations, etc. Vehicles designated as mobile dumps accompany the supported force, providing a ready, immediate source of support during the stipulated period of employment.

b. Floating Dumps.--The primary role of the LVTP7 is to carry assault troops and their initial supplies ashore. However, on rare occasions, one or more amphibious vehicles may be employed as floating dumps during the movement from ship to shore. These vehicles are intended to provide commanders of assault units with an early emergency means of supply available in the same manner as on-call serials. Amphibious vehicles designated as floating dumps normally remain in landing ships near the line of departure until requested by the supported unit, at which time they are launched. Careful planning is required to ensure that floating dumps are embarked on ships not scheduled for diversion to other activities; i.e., causeway launching, beaching, etc., thereby removing them from vicinity of the line of departure. When sufficient supplies have been landed, all remaining loaded floating dumps are unloaded ashore and these vehicles can then be made available for other assignments.

c. Logistic Capacities.--See appendix M for an illustration of typical LVTP7 cargo loads.

Section IV. SPECIAL LANDING OPERATIONS

1401. GENERAL

The special landing operations discussed in this section are applicable only to the assault amphibian vehicle. Due to environmental factors, certain modifications in technique are required, including added emphasis on planning and special training of participants.

1402. NIGHT LANDING OPERATIONS

The techniques for launching and landing amphibious vehicles in the amphibious assault enumerated in section III, this chapter, remain valid for landing operations conducted at night. The following areas require special consideration whenever night landings are planned and conducted:

a. Briefing.--All amphibious vehicle personnel are thoroughly briefed on the unit's mission, signals to be employed, formations to be used, hydrographic data, location of enemy beach installations, and terrain features ashore. Details with regard to underwater barriers, retraction from the beach, rendezvous areas, and secondary missions are emphasized.

b. Time Schedules.--Schedules for formation of waves, crossing the line of departure, and any other multiple vehicle activity requiring close control are drafted, rehearsed, and adhered to strictly. When tactically feasible, the scheduling of the landing just prior to daybreak facilitates recovery of disabled vehicles.

c. Communications.--Lights constitute a valuable asset to night communications. Light signals must be approved and coordinated by the senior area commander to preclude confusion. Information passed by light signals must be simultaneously passed by other means to preclude nonreceipt of information by the intended recipient. See appendixes N and O for an illustration of common light signals. Other signals may be prescribed by the appropriate commander. (See FMFM 10-1, Communications.)

d. Formations.--The simplest formation to form and control is utilized during night operations. Column or close wedge formations best meet these criteria. (See fig. 14.) Crossing the line of departure is best accomplished by keeping vehicles in column, forming a close wedge just prior to landing.

e. Individual Initiative.--Emphasis is placed on use of increased initiative by individual crews. Such initiative is required due to the inability of any of the command and control personnel to influence the course of events aboard an individual vehicle.

f. Safety Precautions.--Section VIII, this chapter, describes safety precautions during night operations.

1403. COLD WEATHER LANDING OPERATIONS

Amphibious vehicle units, as any other unit, operating in arctic or other cold weather areas must cope with increased problems of maintenance and difficult operating conditions. Extensive mud flats, shallow lakes, and streams may make vehicular mobility during the warmer months a greater problem than during cold weather. Working mechanisms of the vehicles may operate sluggishly in cold weather, even though special lubricants are used. The LVT is designed to operate in temperatures ranging from -65 degrees to +125 degrees. A readily adaptable winterization kit is available for contingency.

a. Sea Ice.--The greatest peril inherent in the conduct of cold weather landings is sea ice. In areas where ocean currents prohibit the accumulation of ice and when no ice is present due to the season of the year, amphibious operations are conducted routinely. In areas where pack ice, in the form of icebergs or landfast ice fields exist, landing operations will be severely limited in scope and may be entirely impossible.

b. Effects of Water.--Personnel who are lifted from ship to shore in arctic areas must be completely protected from exposure to the water while en route. Immersion for even a short period of time may prove fatal. Amphibious tractors are ideally suited to dry landings in such arctic areas because of the watertight nature of the vehicle and its ability to attain the beach under most circumstances.

c. Effects of Terrain on Landings.--Arctic terrain, in itself, constitutes a difficult obstacle for amphibious forces. The arctic contains land forms varying from extensive coastal plains to rugged mountains cut by long deep fiords. Glaciers, which usually enter or approach very near to the sea, make an unreliable platform for landing and limit the maneuverability of amphibious vehicles. Frozen ground is common to the arctic as a whole during winter months. During the summer months, the ground thaws to a depth varying from a few inches to several feet. The underlying permafrost (permanently frozen ground) prevents effective drainage and the result is extensive swampy areas. Coastal arctic plains generally provide an adequate platform for landing tracked amphibious vehicles over the beach. The principal limiting factor in such landings is the formation of swampy areas during the summer months. A thorough reconnaissance of proposed landing sites is required prior to any cold weather landing.

Section V. MECHANIZED AND SPECIAL OPERATIONS ASHORE

1501. GENERAL

This section discusses operations ashore. When operating ashore, LVT's are primarily utilized in support of combat operations where mechanized forces are being employed. The vehicles provide the infantry and support personnel mobility equal to that of the tanks. Additionally, the LVTC7 provides mobile command post facilities for battalion and higher headquarters. Special operations to include night, desert, jungle, mountain, and cold weather operations are also contained in this section. The techniques discussed in this section are in most part applicable to all amphibious vehicles. Where portions of this section are specifically applicable only to certain amphibious vehicles, it is so indicated. Amphibious vehicles are ideally suited to employment in a wide variety of environments because of their diverse capabilities. In many instances, the only limitation in employing amphibious vehicles is the resourcefulness of the commander.

1502. MECHANIZED OPERATIONS

LVT's operate in support of, and as an integral part of, the mechanized combined arms task force. They provide mobility, a degree of armor protection for embarked personnel, and contribute to the direct suppressive fire capability of the force. LVT's should not be utilized to transport logistics supplies unless the area is forward of the FEBA, or it cannot be transported by other means. Wheeled vehicles may be utilized in mechanized operations as logistics transports, prime movers of equipment, and as integral parts of weapons systems. A detailed discussion of mechanized operations is contained in FMFM 9-1, Tank Employment/Antimechanized Operations.

a. Forces.--A mechanized task force is a combined arms team consisting of infantry, tanks, and assault amphibian units with support from combat support and combat service support units.

(1) Mechanized Task Force

(a) Command and Control.--The tank and infantry battalion commanding officers and staff are utilized to exercise command and control. By utilizing the tank battalion headquarters as a maneuver element control unit, the maneuver battalions in a division are increased from 9 to 10.

(b) Organization.--The force is organized by assigning tank companies to infantry battalions and infantry companies to the tank battalion. A typical mechanized task force is outlined below:

1 Command and control: tank or infantry battalion headquarters.

2 Tank company(s).

3 Infantry company(s).

4 Assault amphibian units.

5 Engineers.

6 Antitank weapons (TOW and Dragon).

7 Antiair weapons.

8 Fire support.

9 Logistics support units.

(2) Mobile Assault Companies

(a) Command and Control.--The tank, assault amphibian, and infantry company commanding officers are utilized to exercise command and control. By utilizing the tank companies and/or the assault amphibian company headquarters as assault maneuver element control units, the assault companies in a division are increased.

(b) Organization.--The force is organized by assigning tank platoons to infantry companies and infantry platoons to tank companies. A typical mobile assault company is outlined below:

1 Command and control: tank or infantry company headquarters.

2 Tank platoon(s).

3 Infantry platoon(s).

4 Assault amphibian units.

5 Combat support and combat service support as required from assets listed in subparagraph 1502a(1)(b).

b. Mobility.--Mobility equal to that of the tanks is produced by providing LVT's in sufficient quantity to mount all the personnel of the mobile assault companies, less tank crewmen, and at least the command group of the mechanized combined arms task force.

c. Load Factor.--Embarked elements will maintain their task organized tactical integrity. Therefore, an LVT may be expected to transport from 13 to 25 personnel. The senior unit commander will command the vehicle in tactical situations ashore.

d. Concept of Employment.--The concept of mechanized operations emphasizes mobility, speed, and flexibility. The LVT's contribute to this concept by providing a means by which assault troops and their support personnel are transported rapidly to the objective with a degree of armor protection.

(1) Mobile assault companies cross the line of departure in tactical formations. When contact is established, the vehicles (tanks and LVT's) employ fire and maneuver to close on the enemy. The goal is to transport assault personnel past the forward defensive positions of the objective. Personnel are then dismounted in the best available defilade locations; however, the commander will make the decision as to time and place to dismount troops based on the tactical situation.

(2) Tactics, methods of attack, and techniques of movement for mechanized forces are contained in FMFM 9-1, Tank Employment/Antimechanized Operations.

(3) The decision to employ mechanized forces is based on mission, situation, and area of operations. Principally, if a tank can be employed, so can an LVT; therefore, mechanized forces as described above should be utilized.

e. Mechanized Force Communications.--In order to fully exploit the potential of mechanized task forces, dependable communications are mandatory. Without such communications, command cannot be exercised, reaction time is slow, and decisions lack timeliness.

(1) Extent of Communications.--Communications are required within the force, with any units included in a linkup plan, with higher headquarters, and with units external to the force itself, such as air, naval gunfire, logistics support elements, and emplaced artillery.

(2) Mobile Command Post.--The task force commander and his staff are provided LVTC vehicles in order that mobile command posts may be established. Sufficient equipment is contained to provide required internal and external communications. Appendix O lists ccommunication equipment available in the LVTC for embarked commanders. See chapter 2 for a discussion of the employment of the command LVT.

(3) Other Communication Means.--Alternate methods of communications within the force are sound and visual signals, messengers, and pyrotechnics.

f. Execution of the Mechanized Attack

(1) Figures 18 through 21 illustrate the concept of employment of three sections of LVT's with a reinforced rifle company embarked. This concept provides the flexibility and positive control over units to enable changes in formations in accordance with the terrain, the frontages assigned, and the anticipated enemy situation. In addition, the embarked infantry retains complete unit integrity and, if required to dismount, find themselves in tactically sound formations that adhere to the principles of war and respond to the immediate situation.

(2) Figures 18 and 19 depict the three-section concept within the LVT platoon with a reinforced rifle company embarked. Variations are based on weapons platoon employment and the number and types of weapons attached from the infantry battalion. The first two LVT sections are commanded by the LVT section leaders and are the maneuver sections. The third section is the reserve section and is commanded by the LVT platoon sergeant. Each section carries an infantry platoon and attached weapons. The remaining LVT's carry the LVT platoon commander, the rifle company commander, and the weapons he has retained for general support. The role of the reserve LVT section and the embarked infantry platoon may change to a maneuver role from time to time, especially when several objectives are taken in a short span of time/distance or in response to an unexpected enemy situation. Command and control is necessarily a joint, mutually benefitting effort between the LVT and infantry chains of command. The following individuals must develop rapport and maintain continuous communications throughout the operation:

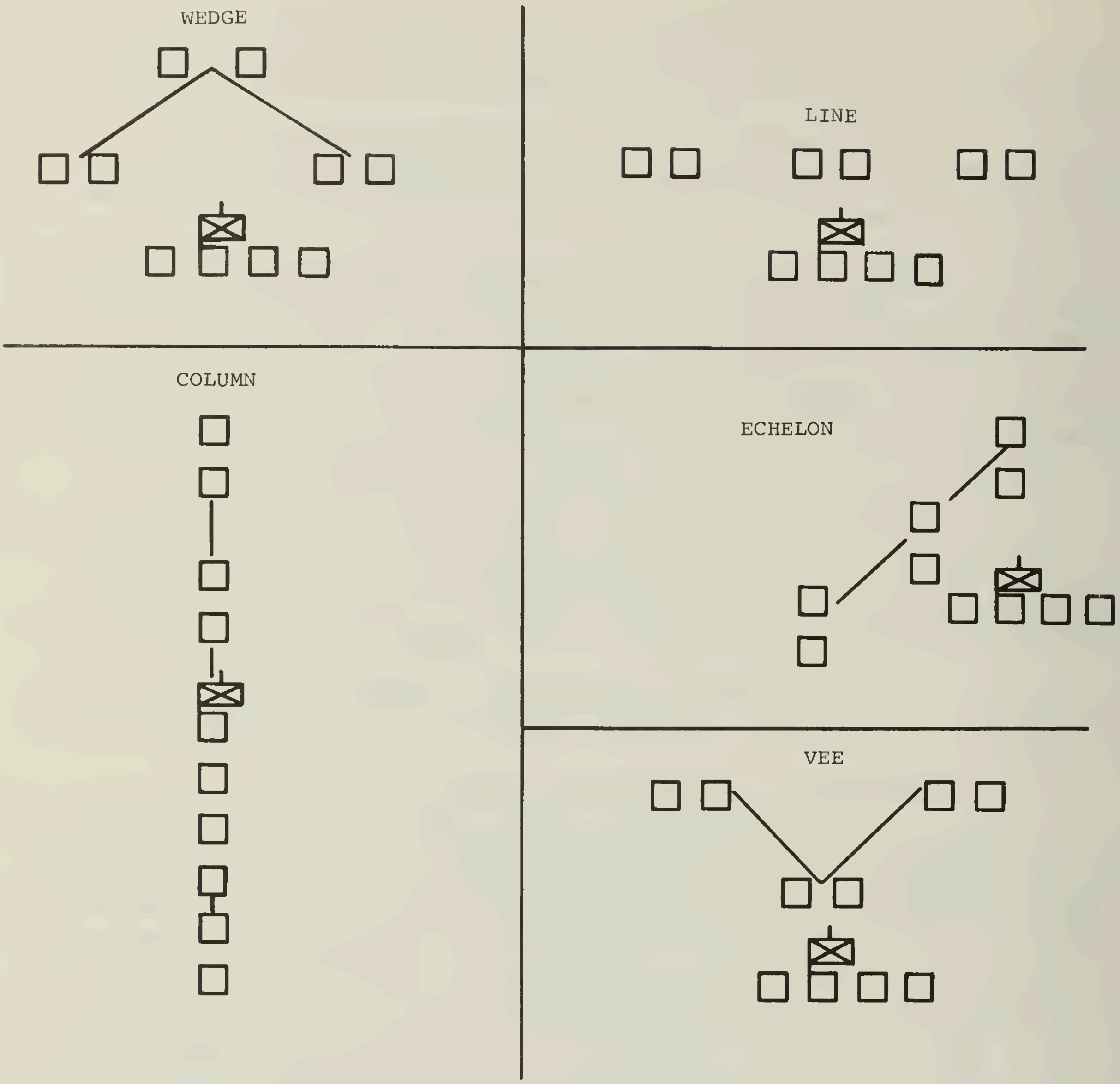


Figure 18.--Weapons Platoon of the Rifle Company in General Support (Each Rifle Platoon is Assigned Two LVT's).

(a) LVT crew chief and the infantry squad leader.

(b) LVT section leader and infantry platoon commander.

(c) LVT platoon commander and infantry company commander.

(3) The following tactical considerations must be taken into account during mechanized/armored operations:

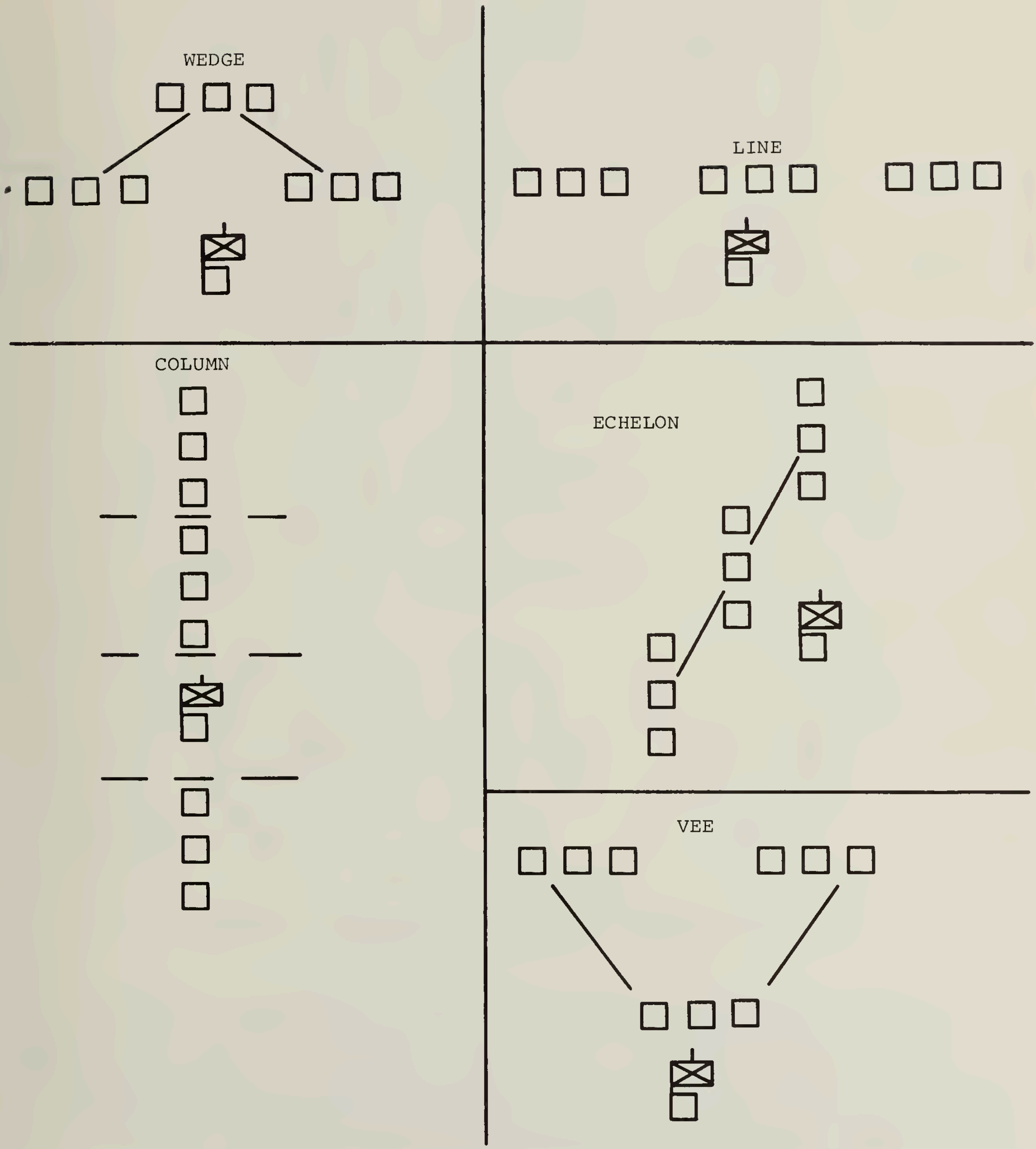


Figure 19.--Rifle Platoon With Weapons Attached
(Each Rifle Platoon is Assigned Three LVT's).

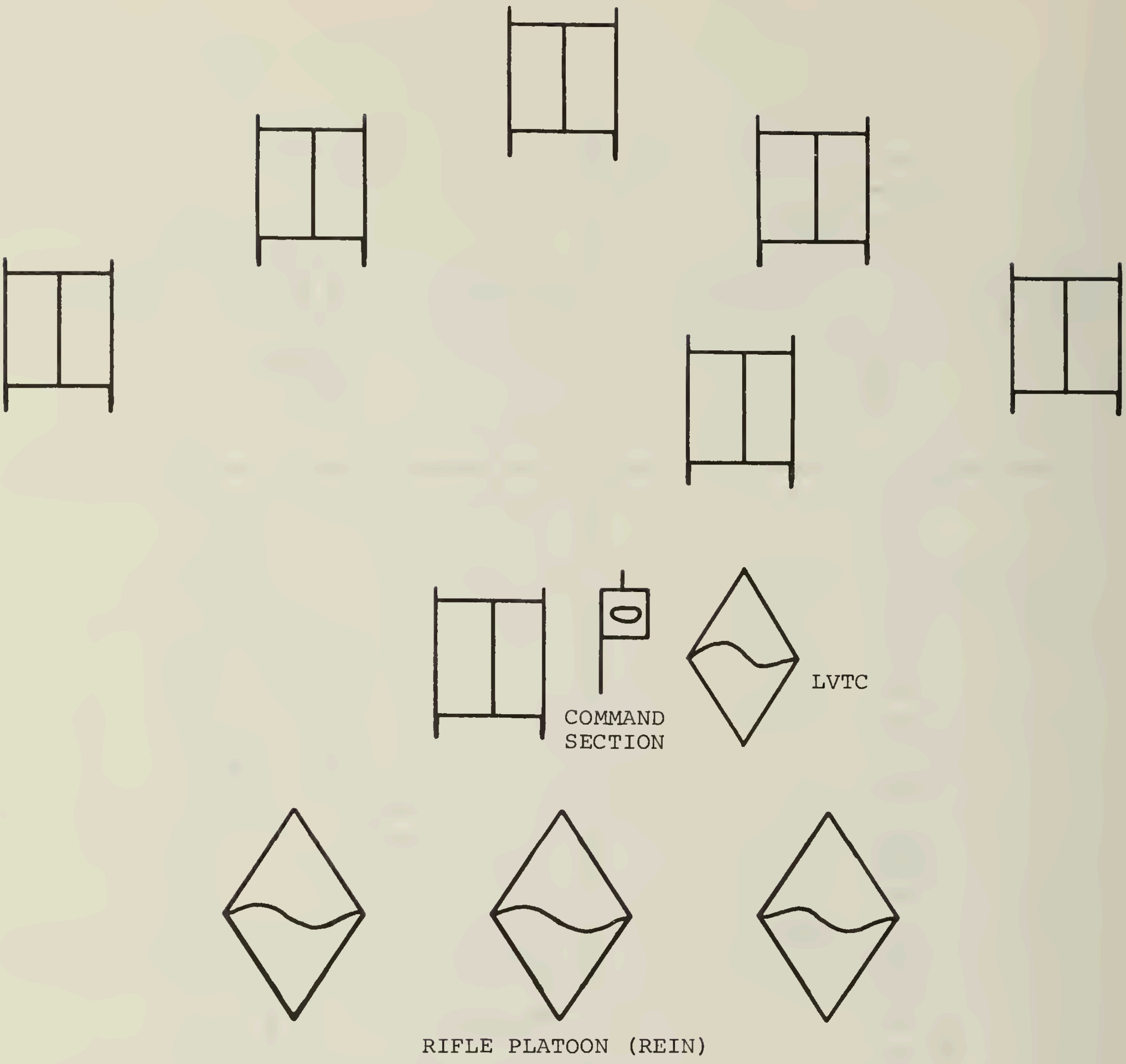


Figure 20.--Cross-Attachment/Team Concept; Sample Formation for Tank Heavy Team.

(a) Use of bounding and traveling overwatch techniques during movement to contact.

(b) Continuous awareness of location by grid coordinates to prevent delay in calling supporting artillery. On-call artillery frequencies should be preset on the RT-246. The odometer and the AN/KSN-1 magnetic navigation set may be used to keep track of distance and direction.

(c) Use of reconnaissance by fire or scouting parties (either mechanized infantry or dismounted troops).

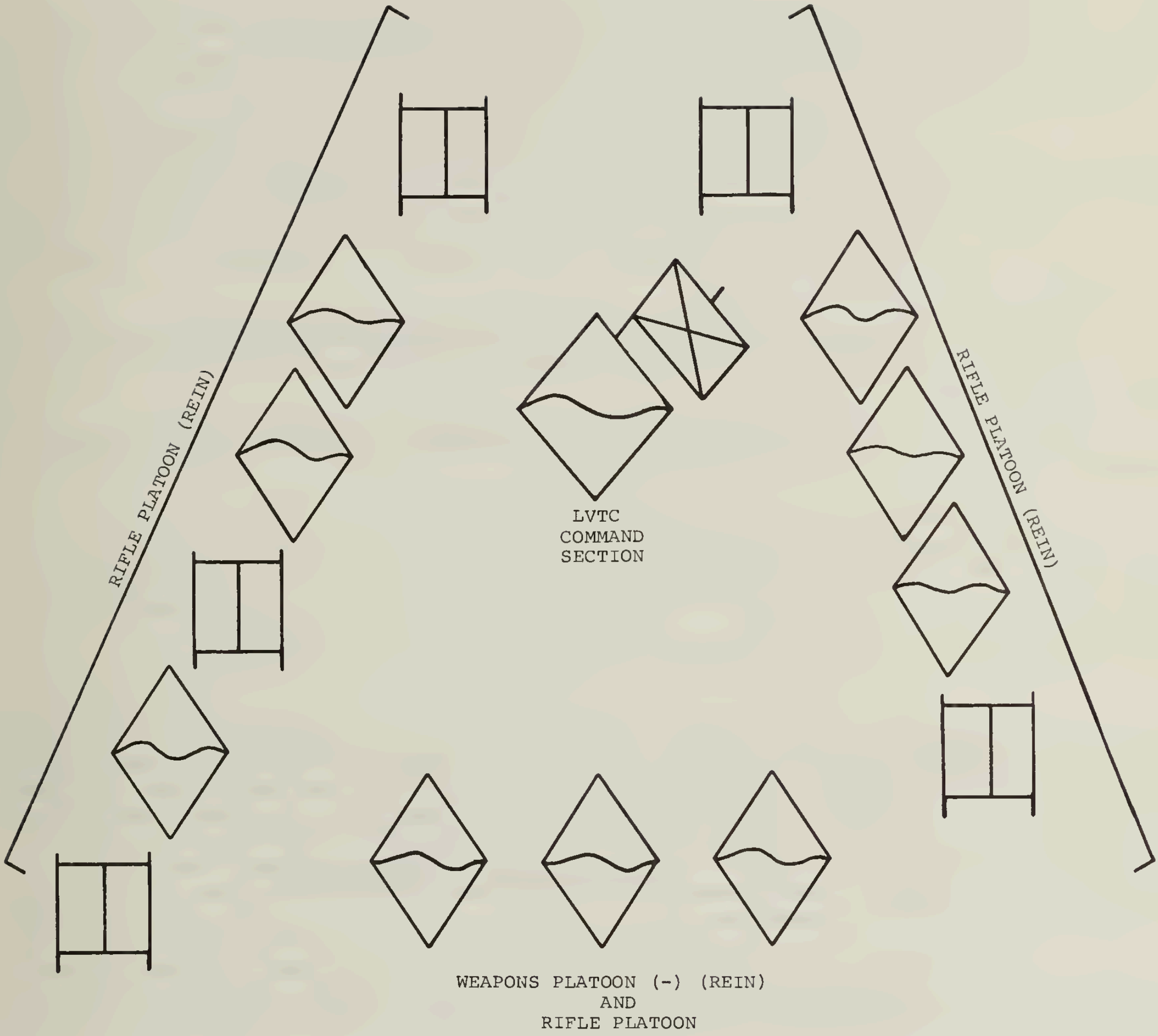


Figure 21.--Cross-Attachment/Team Concept; Sample Formation for Infantry Heavy Team.

(d) Plan for recovery and evacuation of vehicles (task force from battalion or company maintenance). Instead of tanks or LVT's, the tracked vehicle transporter, 65-ton, M793 should be employed when possible to evacuate disabled vehicles.

(e) Use of supporting fire for dismounted infantry.

(f) Employment of smoke to obscrue the enemy's observation.

(g) M85 fire cannot be delivered at ground level on the left flank due to the hull override characteristic of the LVTP7. Embarked M60 machineguns can help to compensate for this.

(h) Immediate action to counter ambushes, antitank guided missiles (ATGM's), and other surprise enemy action calls for independent action, in accordance with previously rehearsed drills by all hands.

(i) Formation changes should be made without stopping to conform to the anticipated enemy situation, terrain, frontages assigned, weather, and visibility during the approach march; stop only in hull defilade.

(j) Always develop alternate routes of approach, schemes of maneuver, and plans of attack.

(k) Make immediate use of suppressive fire from organic and supporting arms to destroy enemy weapons and degrade his ability to effectively engage his forces.

(l) Refueling may be accomplished by LVT's mounting two portable, 500-gallon fuel pods and a pump.

(4) The formations shown in figures 20 and 21 are samples of the cross-attachment/team concept utilizing LVT's with embarked infantry and tanks. The terms "infantry" and "tank heavy" refer to the density of weapons from each unit and determine whether the team will be commanded by the infantry or tank commander. These formations and the weapons employed may be adjusted to fill a variety of needs, to include antiarmor.

(5) Once commited, the tank force is aggressive in continuing its attack to the objective. Positive action is planned for and taken with regard to disposition of disabled vehicles. Those which cannot be repaired before the rear point of the force has passed, and are in danger of capture by the enemy, should have the weapons and radios removed so that they cannot be used by the enemy. They would then be available for recovery when the situation permits. If little or no possibility of capture exists, vehicles are unloaded, abandoned, and later recovered by the force itself or by a backup service support.

(6) One vehicle would be designated and equipped as the force aid station. Emergency assistance can be provided by the vehicle so designated until evacuation to support areas can be accomplished. Evacuation can be accomplished by LVT's or by helicopter.

1503. NIGHT OPERATIONS ASHORE

Amphibious vehicles are the only personnel carriers currently included in the inventory of Marine Corps equipment that possess a degree of armor protection. The employment of amphibious vehicles as components of mechanized task force operations, including night attack by such forces, is therefore contemplated.

a. Night Attack Characteristics.--Night attacks are characterized by a decrease in aimed firepower, compensated for by an increase in fire concentrations; by limited visibility and control, giving added emphasis to the importance of planning; and by a decrease in distance to the target, based on difficulties in maintaining direction and control.

b. Planning.--Factors of importance in planning for night operations are:

(1) Reconnaissance.--Detailed and thorough reconnaissance during daylight and darkness is conducted. Physical reconnaissance is supplemented by aerial photographs, maps, and surveillance devices. Important considerations include the positive location of the assembly area, attack position, routes of advance, line of departure, probable line of deployment, and the objective.

(2) Maneuver Plan.--The plan of maneuver to the objective is based on the scheme of maneuver of the supported unit. Where possible, changes of direction are avoided once the line of departure has been crossed.

(3) Formations.--Amphibious vehicles normally cross the line of departure in a line of platoons in column. Distance between elements is kept to a minimum in order to assist in control.

(4) Control Measures.--In addition to normal internal control procedures, the following techniques are utilized during night attacks:

(a) Platoon points of departure are established.

(b) Platoon routes of advance are selected.

(c) Section release points are utilized.

(d) Phase lines beyond the objective and to the flanks are designated.

(5) Means of Identification.--Identification within units is accomplished by use of panels on vehicles, armbands on personnel, luminescent markers affixed to leaders, searchlights or other lighting schemes, and tracer ammunition. Detailed planning is required in this area.

(6) Miscellaneous Considerations.--Amphibious vehicle commanders consider such other factors as the scheduled time of attack, fire support plan, employment of their vehicles after seizure of the objective, battlefield illumination, and logistic requirements in preparing for operations at night. Proper employment techniques are planned that ensure maximum protection to vehicles and personnel against counterfire and antitank means.

1504. DESERT OPERATIONS

The nature of the desert, that of open terrain with great distances generally unimpeded by obstacles, lends itself to military operations by a highly coordinated, mobile self-sustaining force. Amphibious vehicles, when properly prepared for such missions, can be effectvely employed in desert operations. The effects of heat on embarked passengers and crew must be considered as a limiting factor, particularly when operating with all hatches closed. During desert operations, it is important to stress extra preventive maintenance.

a. Considerations Involved in Desert Operations.--Major military considerations involved in desert operations, all of which influence the employment of amphibious vehicles, are:

(1) Highly Mobile Forces.--In the desert, vehicles are not road bound and can move rapidly cross-country. Critical terrain features are usually widely separated, necessitating employment of a rapidly moving force. Because of the open nature of desert terrain, heavy reliance is made on the use of compasses and other navigational equipment to maintain direction.

(2) Adequate Maintenance and Supply Procedures.--As in other mechanized operations, an adequate and continuing supply of fuels, lubricants, spare parts, and general supplies is critical to the efficient operation of amphibious vehicles. The supply of water is critical to vehicles in the desert. There is a limit to the quantity of fuel and water which can be carried by vehicles themselves, since any increase in amounts of these liquids carried creates a resulting increase in the number of vehicles which must be utilized. Helicopter resupply, to include water, is the most feasible solution in desert operations.

(3) Dependable Communications.--Communications by wire during desert operations is virtually impossible because of the mobility of desert forces. Radio is relied upon as the principal means of communication within and outside of the force. Extensive preventive maintenance of communication equipment is required to prevent damage to the equipment by sand, dust, and extreme heat. As in the mechanized concept, a common command net is required for all force units.

(4) Coordinated Action Between Ground and Air Elements.--This coordination includes the provision of logistic support by helicopter, as well as tactical support by observer, fighter, close support, and photo aircraft.

b. Principal Vehicular Considerations.--It is the intent of this paragraph to outline only the major areas of concern and to familiarize the commander with the vehicular limitations involved.

(1) Mobility.--The desert floor generally creates a good platform for tracked or wheeled vehicle movement. Sharp turns and abrupt halts are avoided, reducing the possibility of the vehicle sinking into the sand. Matting may be required for heavy amphibious vehicles to cross some areas of soft sand.

(2) Cooling System.--The heat of the desert adds emphasis to the need for an adequate, efficient cooling system. The LVT, for example, has a cooling system capacity of 25 gallons of water. Maintaining a supply of water sufficient to cool all vehicles is a major consideration. The entire cooling system, to include fan operation, should be carefully checked prior to employing vehicles in the desert.

(3) Navigational Equipment.--The desert, because of its open, flat nature, increases the requirement for navigational equipment contained within vehicles. As a minimum, magnetic compasses are inspected to ensure that they are in operable condition.

(4) Batteries.--Battery water evaporates rapidly in the desert, and distilled water is difficult to obtain. Distilled water is kept in nonferrous containers to reduce evaporation and to prohibit introduction of impurities. A supply of spare batteries is required.

(5) Camouflage.--Vehicles should be painted with camouflage paint before being committed to operation in the desert. Use of camouflage netting will also improved camouflage discipline.

(6) Damage From Sand and Dust.--Many precautions are taken to protect vehicles from sand and dust damage. The engine is protected by keeping it as free as possible of oil and grease. Sand and dust cannot adhere to a clean surface. Care is exercised in fueling, lubricating, and changing oil to ensure that sand and dust do not gain entrance to working mechanisms. The air cleaner element indicator should be checked following operations in sand and dust.

1505. JUNGLE OPERATIONS

Amphibious vehicle operations in the jungle environment may be limited to tracked vehicles only. The absence of trafficable roads often precludes effective employment of wheeled vehicles such as the amphibious truck. Jungle terrain is typically rugged, with deep valleys and steep ridges, all of which are heavily overgrown with dense vegetation. Streams and rivers are common and are fed by the normally heavy rainfall. Existing trails and roads are narrow, muddy, and often overgrown, either entirely or in part. These must generally be widened to accommodate the great bulk inherent in amphibious vehicles. Visibility is severely reduced by jungle growth and vegetation. Amphibious vehicles may be the only vehicle available to the commander for lift of personnel and equipment while employed in the jungle.

a. Tactical Considerations.--Jungle warfare normally combines several types of special operations, such as river crossings and night combat. Tactics for amphibious vehicles involved in these classes of operation are valid but are affected by the jungle environment. Critical terrain features in the jungle are roads, trails, bridges, and communication centers. High ground is less critical because of reduced visibility.

(1) Mobility and Security.--Cross-country movement is very difficult, even for tracked vehicles, and mobility is drastically decreased. As a result, the need for local security for amphibious vehicles increases. Efficient reconnaissance of routes to be taken by amphibious vehicles allows the vehicles to avoid impassable swamps, mountains, valleys, and areas where there are no trails.

(2) Camouflage.--Excellent facilities for natural camouflage of vehicles and personnel exist in the jungle. Overhead observation is virtually impossible if proper precautions are taken.

(3) Navigation.--Based on limited observation and lack of recognizable terrain features, map reading and compass use are important to navigation. Maps reflecting trails and roads in the jungle are not always accurate and cannot replace physical reconnaissance.

(4) Communications.--The heavy foliage of the jungle can severely limit the range of radio equipment installed in vehicles. The use of other means of communication, particularly messenger in static situations, must be planned to overcome this problem.

b. Logistic Considerations.--Resupply during operations in the jungle is complicated by the environment. Once supplies have been received, they are prone to rapid deterioration because of moisture. Supply of fuel, water, and lubricants, always important to the amphibious vehicle unit, may be a problem. As the only ground vehicle able to negotiate the terrain, the amphibious vehicle's most important role in jungle operations may well be as a supply vehicle.

c. Vehicular Considerations.--The climatic conditions encountered in jungle areas have a deteriorating effect on all metals, rubber, and in particular, working parts of weapons or vehicles. Rust forms quickly and preventive maintenance requirements are strict. Lubrication of working parts is accomplished daily. Oil levels are checked and maintained at maximum capacity. Communication equipment is inspected and lubricated as necessary. Moisture renders equipment unserviceable rapidly unless preventive maintenance procedures are thorough and continuing.

1506. MOUNTAIN OPERATIONS

Employment of amphibious vehicles in mountain operations is limited in scope by the weight and bulk of the vehicle itself, as well as the difficulty of supporting an amphibious vehicle unit logistically in mountainous areas. In mountain operations, requirements for fuel and POL are increased significantly because of the added stress on the LVT's. Planning must include the increased requirements. Amphibious vehicles possess the ability to ascend grades of 60 percent and can negotiate 60-percent side--slopes with a combat load. These characteristics, however, are intended principally to enable the vehicle to negotiate obstacles and climb hills close inshore, rather than for extended mountain operations. Employment of amphibious vehicles in limited mountain operations is possible. Amphibious vehicles may be employed to transport troops and equipment. Care is exercised to ensure that roads over which the vehicles travel are passable. Tracked amphibious vehicle brakes are not built to support rapid or frequent stops. There is an inherent problem of stalled vehicles on narrow roads, which prohibits passage or turnaround of other vehicles. This is guarded against, when possible, by choosing multiple routes and positioning maintenance personnel and recovery vehicles throughout the column.

1507. COLD WEATHER OPERATIONS

Amphibious vehicle units operating under conditions of extreme cold are faced with problems of mobility, added maintenance, and survival of personnel. Mobility of vehicles, both tracked and wheeled, becomes even a greater problem as the weather warms because of lakes, streams, and mud formed by melting ice.

a. Tactical Considerations.--The arctic terrain is rugged and mountainous, cut by long valleys, streams, and rivers. In areas where the climate is relatively temperate, operating conditions resemble those found in other parts of the world. However, where ice and snow are found year round and temperatures drop well below zero degrees all during the winter months, the most difficult of operating environments is created.

(1) Mobility.--Only tracked amphibious vehicles may operate in areas of frozen ground or snow, or in areas where frozen ground has melted to some degree during warmer weather. Even tracked vehicles experience difficulty in achieving any real degree of mobility under such circumstances. The LVT operates dependably to a level of 35 inches of snow, after which it is prone to bury itself because of the low-slung configuration of its

chassis. Frozen ground is broken by deep ruts into which vehicles may fall without warning. During melting periods, the formation of streams and extensive mud areas presents a formidable obstacle to amphibious vehicle operation.

(2) Camouflage.--Lack of vegetation in arctic areas increases the requirement for camouflage discipline. Ingenuity is required in order to conceal the bulk of an amphibious vehicle. Camouflage of areas where many vehicles are situated, such as tractor parks and maintenance areas, presents an even greater problem. The phenomenon known as ice fog creates additional camouflage problems. Formation of ice fog is the direct result of crystallization of exhaust or similar fumes. The resulting clouds of ice fog rise directly above the source in low temperatures, pinpointing a vehicle with engines operating. Increased winds and resulting temperature rise negate the effect of ice fog to some degree. Camouflage painting for arctic operations will normally be prescribed by the landing force.

b. Logistic Considerations.--Weather conditions and terrain in arctic regions restrict the efficiency of resupply and ability of units to maintain vehicles and store supplies. The importance of a flexible, practical logistics support plan cannot be overemphasized. Amphibious vehicle units may provide the principal means of moving supplies from ship to shore and in the subsequent operations ashore. Logistic considerations of increased importance while in arctic regions include continued supplies of hot rations, water, clothing, lubricants and oils, and spare parts to replace those damaged by cold weather.

c. Vehicular Considerations.--Detailed planning, preparation of vehicles, and training of personnel are required if arctic operations are to achieve success. Principal vehicular considerations include:

(1) Condition of Suspension System.--Wet snow may become packed in the tracks of amphibious vehicles, temporarily restricting or immobilizing them. The same effect may result from ice, and is more difficult to remove. Stationary vehicles will freeze to the ground in moderately cold weather unless dunnage or other supporting material is placed under the tracks. If the vehicles cannot be raised off the ground, and the tactical situation permits, they must be moved as often as necessary to prevent freezing.

(2) Carbon Monoxide Hazard.--Intense cold, strong winds, and heavy snowfalls induce personnel to seek whatever shelter is available in arctic regions. The interior of the LVT offers warmth and protection from the elements. Although the carbon monoxide hazard has been significantly decreased in the newer vehicles, the following are criteria for use of the LVT as a warming area during cold weather:

(a) Personnel do not occupy LVT's for sleeping unless authorized by the amphibious vehicle unit commander.

(b) If personnel are authorized to sleep aboard vehicles, two access hatches are kept open at all times.

(3) Engine.--The greatest problem inherent in cold weather engine operations is lack of engine lubrication resulting from thickened oil. Appendix N sets forth cold weather starting procedures for LVT's.

(4) Batteries.--Battery power decreases rapidly during cold weather and batteries cannot be satisfactorily charged once the electrolite temperature is less than zero degrees. Extended hours of darkness and low temperatures create increased demands on electrical systems, and batteries in particular. Protection is afforded batteries by servicing and cleaning them frequently. Batteries often must be heated before recharge and use during cold weather.

(5) Personnel Heater.--The personnel heater is designed to provide fresh heated air for the crew, personnel, and battery box. It is located on the port sponson forward of the vehicle fuel tank.

Section VI. SUPPLY AND MAINTENANCE

1601. GENERAL

A primary consideration in the employment of amphibious vehicles is the timely provision of adequate and continuous logistic support. In amphibious operations, this requirement is met by sea-based landing force supply and maintenance elements until adequate facilities are established ashore. Combat loading of supplies and maintenance equipment with embarked amphibious vehicle units ensures availability during movement to the objective area and during the assault. This dispersion minimizes serious shortages of maintenance equipment and supplies which could result in the event of a ship loss.

1602. RESPONSIBILITIES

The extent of parent amphibious vehicle unit responsibility for supply and maintenance of its subordinate elements attached to other landing force elements is clearly specified in the order directing attachment. Attached amphibious vehicle units have a packaged and preserved mount-out block of second echelon repair parts which is used as authorized by the headquarters to which attached. In addition, the attached amphibious vehicle unit carries an operational block of repair parts embarked aboard the amphibious vehicle commander's vehicles, the use of which is his responsibility. These parts are not considered mount-out supplies and are used as required.

1603. PLANNING

Types and quantities of maintenance equipment and supplies to be embarked are determined during the planning phase. The quantity of supplies embarked is normally governed by requirements of the unit and availability of shipping. A flexible maintenance, repair, and service program is planned to commence as soon as the situation permits. Supplies and maintenance equipment for embarked amphibious vehicle units must be accessible aboard ship until maintenance and supply sections are phased ashore.

1604. SUPPLY AND MAINTENANCE AFLOAT

a. Supply Ships.--Sufficient fuels and lubricants are embarked with amphibious vehicles to provide for initial servicing. The commander amphibious task force designates certain ships as supply ships. Specified quantities of fuel and lubricants embarked on these ships provide resupply during initial stages of the operation. Fueling from bulk storage aboard ship is accomplished within or alongside ships by means of the ship's vehicle refueling system. Amphibious vehicles may drive aboard ballasted LSD's and refuel from one of the ship's organic fuel storage tanks, an economical and rapid refueling procedure.

b. Repair Ships.--The commander amphibious task force also designates certain vessels as amphibious vehicle repair ships. These ships serve as maintenance and repair centers until these operations are phased ashore. Additional amphibious vehicle maintenance personnel are embarked aboard these ships. A minimum of one such ship for each colored beach is essential for efficient operation. The LSD is best suited as a repair ship because of the ease with which amphibious vehicles may embark and debark.

c. Fuel Boats.--Landing craft or barges, commonly known as bowser boats, are loaded with fuel and oil and stationed off each beach by the Navy. Their purpose is refueling amphibious vehicles. Bowser boats are equipped with power-driven pumps and are refueled from supply ships as required. Their mission is completed when adequate refueling stations are established ashore.

d. Repair Vehicles and Craft.--The recovery of disabled vehicles during the ship-to-shore movement is the responsibility of the naval element of the amphibious task force. Until suitable repair facilities have been established ashore, vehicles damaged or crippled beyond the capability of recovery craft are towed to repair ships. Certain naval craft (LCU and LCM) are normally designated and equipped as repair craft. The LVTR, principal repair facility within the assault amphibian battalion, normally moves ashore in nonscheduled waves along with the amphibious vehicle unit command group. Once ashore, the LVTR is able to assume its role in repair operations.

1605. SUPPLY AND MAINTENANCE DURING OPERATIONS ASHORE

a. Supply.--Each amphibious vehicle unit establishes its supply facilities ashore as soon as possible. Separation of units may require more than one such facility. Until other means become available, amphibious vehicle units land their own organic supplies. Once ashore, these units replenish supplies in the manner designated by the landing force. Fuel is obtained ashore from bulk fuel dispensing centers.

b. Maintenance.--Amphibious vehicle maintenance areas are usually located proximate to the areas of supply. More than one may be established. These facilities are echeloned shoreward in order to ensure continued availability of facilities. They are located to provide easy vehicular access to and from the beach. Amphibious vehicles can be used to land organic maintenance equipment that will fit inside the LVTP7 cargo compartment. Section VI, chapter 2, contains a complete discussion of maintenance in the assault amphibian battalion, applicable to all amphibious vehicle units. Characteristics of the LVTR are found in appendix C.

c. Responsibility for Attached Amphibious Vehicle Units.--When amphibious vehicle units are attached during operations ashore, the responsibility for their supply, to include provisions for spare parts, fuel, and lubricants, is that of the unit to which they are attached. The timely provision of all classes of supply, particularly those connected with maintaining the vehicle, is critical to maximum vehicle availability. The provision of these supplies requires considerable planning and liaison with the parent unit, as well as increased transportation, storage, and maintenance facilities. Thorough logistic preparation is made by units preparing to attach amphibious vehicle elements.

Section VII. TRAINING OF AMPHIBIOUS VEHICLE UNITS

1701. GENERAL

Training for individuals and units of the assault amphibian battalion is based on the mission and on requirements prescribed by pertinent higher headquarters' directives. The training considerations set forth in this section are generally applicable to all units. Formal schools and classroom work as well as field training are necessary elements of a sound amphibious vehicle unit training program. Field work includes water and land vehicular operation, maintenance of the vehicles, firing of organic weapons, and actual participation in amphibious operations. Supervision at all levels is essential to the conduct of a well-planned, thorough training program. Supervision is accomplished by inspection, testing, and review. Training programs are designated to effect orderly progress from individual to section, platoon, company, and battalion training phases.

1702. TRAINING PROGRAM

The training program for an amphibious vehicle unit depends upon the combat readiness of the command, the level of knowledge and proficiency of personnel assigned to the unit, training facilities available, and the requirements of higher headquarters. Training of the LVT unit comes basically under two main headings: training as an LVT unit and training the LVT unit with infantry or other combat arms which it is to support. A training program balanced between these requirements will produce a proficient unit. Random instruction is not given for the sake of fulfilling the training requirement. All instruction included on the master training schedule is carefully analyzed for its value and contribution to the efficiency and state of training of the unit. Overall training requirements are frequently determined by higher headquarters, and unit training programs are formulated from these guidelines. Unit commanders and their operations officers modify training programs to ensure optimum use of facilities and to facilitate the attainment of new requirements initiated by higher headquarters or created by a new situation.

a. Methods of Instruction.--The principles set forth in FM 21-6, Techniques of Military Instruction, should be followed in the conduct of military training. Emphasis is placed on practical application rather than theoretical instruction. Inclement weather schedules are prepared in advance to cover scheduled periods which are subject to cancellation because of inclement weather or hazardous operating conditions. Proficiency is attained through integrated and concurrent training. Once a subject has been introduced, it is applied at every subsequent opportunity until mastered.

(1) Integrated Training.--Integrated training is that training where two or more subjects are taught simultaneously; for example, amphibious vehicle crew emergency procedures may be taught during water-driving instructions.

(2) Concurrent Training.--Concurrent training is that training conducted simultaneously with other subjects when permitted by the scheduling of a principal subject; for example, weapons firing, communication instruction, and unit camouflage instruction may be conducted during a field exercise involving establishment of amphibious vehicle unit CP's ashore.

b. Commander's Time.--Commander's time in training programs is intended to provide latitude in the scheduled training. It may be used to compensate for interruptions, to bring individuals up to desired levels of proficiency, to conduct refresher training, or to introduce essential training not previously planned.

c. Selection of Instructors.--Maximum advantage is taken of known skills possessed by individuals of the unit in assigning instructors. Careful selection of instructors is made to ensure control of personnel and that instruction is properly imparted. Graduates of specialist schools, particularly in maintenance and communications, are used to conduct instruction in these subjects. Assignment of qualified lower rated personnel to conduct instruction is advisable; it serves as an incentive and also takes advantage of their skills.

d. Safety and Realism.--The conduct of training operations by amphibious vehicles and safety precautions incident thereto are governed by technical manuals, appropriate unit instructions, section VII of this chapter, and appendixes K through S. The objective of amphibious vehicle training is the attainment of maximum realism without sacrificing esential safety precautions.

e. Training Officers and Staff NCO's.--At the discretion of unit commanders, officers not required in the conduct of training of the unit may be given officer-level instruction. Staff noncommissioned officers are included in the officer-level instruction when desirable. Training programs set forth those subjects necessary for proper and proficient performance by officers and staff NCO's of the command.

f. Unit Training Phase.--The commanding officer, through careful and continuous analysis of the training status of the unit and its members, regulates the progress from individual to section training and throughout advanced training stages. He determines the progress of training from basic level to advanced level in order to ensure adequate training in both phases of the program.

g. Field and Waterborne Training.--Amphibious vehicle units train in the field under simulated tactical conditions whenever possible. Particular attention is given during field training to subjects such as arm-and-hand signals, overland driving, field preventive maintenance, unit control, camouflage, dispersion of vehicles, and formation driving. Individual and unit measures against nuclear warfare are stressed, as are unit defensive measures against organized and guerrilla type forces. Waterborne training for amphibious vehicle units may be conducted as a part of field exercises, or may be scheduled separately. During waterborne training, such subjects as formation driving, vehicle control, emergency procedures, and maintenance after water operations are stressed. It is important that amphibious vehicle units make every effort to train in ocean areas, lakes, rivers, streams, swamps, and any other type of water areas available in order to gain diversified experience. See paragraph 1703 for a discussion of subjects to be included in both field and waterborne training courses for amphibious vehicle units.

h. Night Training.--Training of amphibious vehicle units at night is essential to the combat readiness of the command. Darkness introduces increased problems of control and coordination, and proficiency under such conditions is only attained by actual operation. Emphasis is placed on individual initiative during night training. This training includes afloat and ashore operations, and should include landing ship training when ships are available.

i. Amphibious Exercises.--The mission of the Marine Corps and of its amphibious vehicle units makes mandatory the conduct of regularly scheduled amphibious exercises under the most diversified conditions possible. Such exercises progress from planning and embarkation through the ship-to-shore movement and subsequent operations ashore, either tactical, logistical, or both. The more varied the amphibious vehicle unit role, the more thorough is the training. Logistic support of amphibious vehicle units during these exercises is conducted as realistically as possible in order to determine the ability of the unit and its subordinate elements to render support on a combat basis. FMFM 3-2, Amphibious Training, contains additional details on the subject of amphibious vehicle training during amphibious exercises.

j. Tactical Exercises.--Tactical exercises are conducted in order to apply tactics and techniques to specific situations under conditions simulating actual combat. The success of tactical exercises is dependent upon the amount of realism afforded. Use of aggressors contributes substantially to the realism of training. All phases of the unit operation should be tested during tactical exercises, to include administration, supply, communications, and maintenance. Tactical exercises are intended to effect the integration of the components of amphibious vehicle units into effective and coordinated commands, ensuring their ability to successfully perform their operational missions.

(1) Training During Exercises.--As many of the below listed training categories should be incorporated in tactical exercises as time and circumstances permit:

(a) Communications, including exercise of the radios on board the LVTC, and the establishing of battalion, company, and platoon command nets, where applicable.

(b) Establishing liaison to supported units.

(c) Survival, evasion, resistance, and escape (SERE).

(d) Concealment and camouflage of vehicles and individuals.

(e) Defense against NBC attacks.

(f) Employment of mines and demolitions.

(g) Unit action against air, airborne, and mechanized attack, and means of defending against guerrillas and infiltrations.

(h) Route reconnaissance, controlling vehicle marches, and vehicle formations.

(i) Organizational maintenance in the field.

(j) Field messing and sanitation.

(k) First aid for casualties and evacuation.

(l) Supply procedures to include provision of fuel, oil, lubricants, and spare parts.

(m) Occupying command posts, vehicle parks, and maintenance areas.

(n) Vehicle recovery, to include employment of the LVTR.

(o) Amphibious vehicle driving under all conditions.

(2) Critique.--A thorough critique is held after each field exercise. Insofar as practicable, representatives of all elements of the unit which participated are present at the critique. Emphasis is placed on the purpose of the exercise, good and bad points observed, and methods of correcting deficiencies.

1703. TRAINING SYLLABUS

a. General Considerations.--When developing training programs for individuals and units of the assault amphibian battalion, the following factors should be considered:

(1) Training requirements and exercise commitments assigned by higher headquarters.

(2) State of training of the unit and/or its components.

(3) Availability of vehicles considering maintenance and spare parts requirements.

(4) Requirement for providing basic training for new personnel.

(5) Fitting training program to promotional examination needs of assigned Marines.

(6) Availability of shipping and other support activities such as a shore party.

(7) Coordinated training requirements such as higher headquarters training with the LVTC.

(8) Requirement for separately training NCO's, staff NCO's, and officers.

(9) Availiability of training areas, to include those closely resembling areas of prospective operations.

(10) Requirement for extensive night training.

(11) Requirement for integrating all facets of the unit into tactical and amphibious exercises.

b. Subjects To Be Included.--The following subjects are included in the specialist or technical training program of an amphibious vehicle unit in proportion to the training status and requirements of each unit:

(1) Basic Subjects

(a) On-vehicle instruction on instruments, controls, on-equipment material (OEM), and preventive maintenance requirements.

(b) Seamanship and elementary navigation.

(c) Amphibious vehicle communication equipment and procedures.

(d) Weapons training on weapons organic to the vehicles or issued to personnel.

(e) Amphibious vehicle abandonment and immobilizing procedures.

(f) Camouflaging vehicles.

(g) Embarking on and launching from LHA's, LST's, LSD's, and LPD's.

(h) Review and inspection of tracked vehicle log books.

(i) Inventory and inspection of OEM.

(j) Amphibious vehicle prewater operational checks and emergency procedure practice.

(k) Water, land, and formation driving of amphibious vehicles.

(l) Organizational maintenance procedures.

(m) Amphibious vehicle cargo loading, trimming, and securing.

(n) Arm-and-hand signals.

(o) Before operation, during operation, at the halt, and after operation checks.

(2) Advanced Subjects

(a) Beach markers, control flags, and numeral flags.

(b) Integrated waterborne and shipboard training with ships of the amphibious fleet.

(c) Employment of amphibious vehicle units in the amphibious operation.

(d) Amphibious vehicle operations ashore and during river crossings.

(e) Amphibious vehicle unit (battalion, company, platoon, section) training and tactical tests.

(f) Recovery operations.

Section VIII. SAFETY PRECAUTIONS REQUIRED IN AMPHIBIOUS VEHICLE TRAINING OPERATIONS

1801. GENERAL

Effective safety requires trained and skilled LVT crews, properly oriented passengers, and well maintained vehicles. Strict adherence to the instructions concerning safety precautions for passengers is required.

1802. EQUIPMENT FOR CREW AND PASSENGERS

a. Helmets.--All personnel embarked in moving amphibious vehicles will wear helmets. Crewmembers normally wear tank communication helmets while passengers wear the steel helmet.

b. Life Preservers.--All personnel wear life preservers at all times during water operations. Amphibious vehicle units provide life preservers for crewmen and embarked personnel. Personnel embarked in the amphibious tractor should wear the inflatable type life jacket. Inflatable type life jackets will be worn around the neck while vehicles are waterborne and not contained in the carrying case at the belt.

c. Safety Belts.--Safety belts are worn by all seated amphibious vehicle crewmen and passengers while the vehicle is in motion. Safety belts will not be worn while the vehicle is waterborne.

d. Normal Combat Equipment.--All embarked personnel with normal combat equipment such as packs, cartridge belts, pistol belts, etc., will wear it loose enough to jettison without delay if required.

e. Survivor's Light.--Each passenger embarked on an amphibious vehicle during night operations will be equipped with a serviceable survivor's light.

1803. REQUIREMENTS FOR PASSENGERS EMBARKED IN AMPHIBIOUS VEHICLES

The safety of both crew and passengers embarked in amphibious vehicles is protected through strict adherence to the following:

a. No person will ride on top of a moving amphibious vehicle, except under the following circumstances:

(1) When performing rescue missions afloat.

(2) During line handling and fending-off operations while laying alongside small craft and ships.

(3) While receiving lines during loading aboard landing ships.

(4) When authorized, while traversing suspected or known enemy mine infested areas.

(5) When employing crew-served weapons.

b. No person will ride aboard a moving amphibious vehicle, either ashore or afloat, with more than his head and waist extending above the hatch. During waterborne operations, the driver's and crewchief's hatches should be open for purposes of control and visibility. Waterborne operations in rough seas and trans-surf operations should be conducted with all hatches closed.

c. No smoking is allowed aboard amphibious vehicles at any time.

d. All troops should be exposed to surf indoctrination training prior to embarkation if possible. Assault amphibian battalions are responsible for conducting this training for all units in the division.

1804. OPERATION OF THE LVT RAMP

All LVT's are equipped with a hydraulically operated ramp, situated on the stern of the vehicle. All personnel must stand clear of the ramp during the time it is operated. The ramp door should be checked prior to entering the water. The following precautions apply to raising and lowering the ramp:

a. Hydraulic Operation.--A ground guide is placed to the rear of the vehicle to ensure that all persons stay clear of the ramp area and direct the driver in raising and lowering the ramp. The LVT horn is sounded prior to the operation of the ramp release lever and during ramp operation.

b. Manual Operation.--When the hydraulic system of the LVT ramp is inoperative, the ramp may be raised or lowered by use of the standard hoist. This operation is more hazardous than with the hydraulic mechanism and the ground guide remains in position until the ramp is secured in the raised position. Vehicles with inoperative ramp hydraulic systems are deadlined with the ramp in lowered position if space is available; otherwise, the ramp will be dogged, the hoist will remain attached, and a sign will be placed both internally and externally indicating "DANGER! RAMP HELD BY HOIST!" In addition, the LVT's towing cable will be attached from the upper cable eye on the ramp, passed through both mooring bitts topside, and secured back to itself by means of the towing shackle. In the event the ramp does break loose, this will restrict its movement to about 1 foot and prevent injury to surrounding personnel. (See fig. 22.)

c. Emergency Operation.--In case of emergency or in an actual combat situation when the most expeditious exit of the LVT is mandatory, the quick release can be utilized. When pulled, the hydraulically operated cable and the dogs holding the ramp are detached from the ramp allowing it to fall freely. This emergency ramp release should be operated only by an LVT crewman stationed aft in the vehicle under command of the vehicle commander. The disadvantage of utilizing the ramp quick release in combat is that the cable to raise the ramp must be reattached manually, thereby exposing the crewman to hostile fire.

1805. MOVEMENT OF LVT'S IN CONGESTED AREAS

a. Whenever LVT's are moved forward in a congested area, a minimum of one ground guide will be positioned in front of the vehicle to guide that vehicle. The vehicle speed will not exceed 5 miles per hour.

b. Whenever LVT's are being backed, regardless of the congestion or situation, a minimum of two ground guides will be positioned--one in

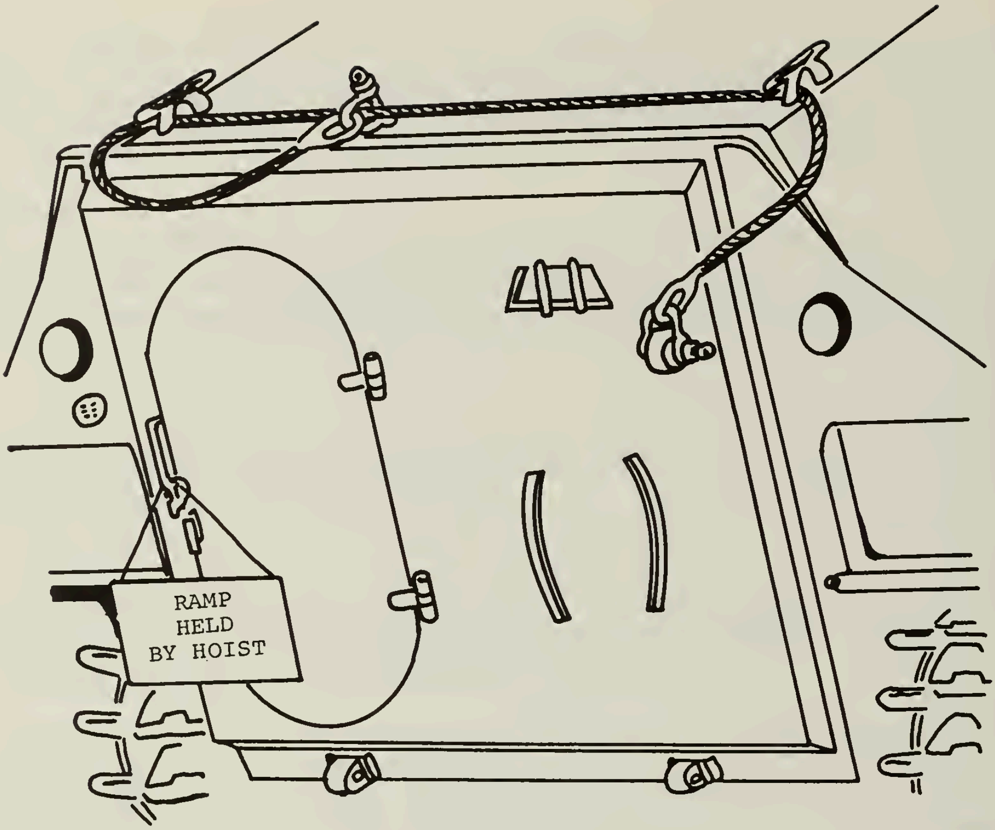


Figure 22.--Configuration for Towing Cable When Ramp is Held by Hoist.

the front and one in the rear--to ensure there are no obstacles or personnel in the vehicle's path.

1806. EMERGENCY EQUIPMENT REQUIRED FOR AMPHIBIOUS VEHICLES

a. Installed Equipment.--Amphibious vehicles are equipped with a horn, a spotlight, and headlights, all of which may be used as signals in the event of emergency.

b. Special Emergency Equipment.--Procedures for signalling during waterborne emergencies are found in paragraph 1808. As a minimum for night operations, the following equipment should be carried aboard each amphibious vehicle:

(1) One battle lantern.

(2) One aircraft signal projector, pyrotechnic.

(3) Four double-star red signals.

(4) Survivor's light for each crewmember and passenger.

1807. VEHICLE EVACUATION PROCEDURES

Safety during water operations cannot be overstressed. It is the crew's responsibility to ensure that all embarked troops are instructed in vehicle evacuation procedures and the proper wearing and functioning of life jackets. The primary principle involved in evacuating amphibious vehicles is strict adherence to instructions from the vehicle crew chief. Appendixes P and Q describe the duties of crewmembers when LVT's are disabled or sinking. Appendix K sets forth duties of the crew in connection with waterborne operations. Procedures set forth below are intended to familiarize nonamphibious vehicle personnel with the sequence of events in case of an emergency.

a. Procedures When Amphibious Vehicles Are Disabled.--The vehicle commander immediately notifies the senior amphibious vehicle officer or NCO afloat in the area and the beach rescue team on radio or other means as outlined by unit SOP. Transfer of embarked troops from the disabled vehicle is accomplished as outlined below.

(1) In fair weather and good seas, the safety boat or rescue vehicle comes alongside to leeward and is secured to the disabled vehicle.

(2) The starboard cargo hatch is opened and locked in the horizontal position.

(3) Personnel are moved to the top deck in increments and instructed to inflate life jackets, if necessary.

(4) The crew closes the cargo hatch after personnel are transferred.

(5) In foul weather or rough seas, the rescue vehicle stands by on the leeward side of the disabled vehicle. Passengers from the disabled vehicle swim to the rescue vehicle in small groups and are recovered by the crew of that vehicle.

b. Procedures When Amphibious Vehicle Is Sinking.--All vehicles of the LVT series are enclosed by cargo hatch covers which are normally closed during waterborne operations. This feature, in addition to two electric bilge pumps which operate off the vehicle electrical system, even when the engine is inoperable, makes vehicle sinkings improbable. However, should the vehicle appear to be sinking with passengers embarked, the following procedures are initiated:

(1) The senior LVT representative and beach rescue are notified.

(2) Cargo hatch covers (see fig. 23) are opened, if time permits, and on the order of the crew chief, embarked personnel jettison equipment, move topside, inflate life jackets, and abandon the vehicle.

(3) Personnel wearing inflatable life preservers jettison equipment but do not inflate the preserver until they have passed through the hatch.

(4) If time permits transfer of personnel, equipment will be taken and procedures as outlined for disabled vehicles will be followed.

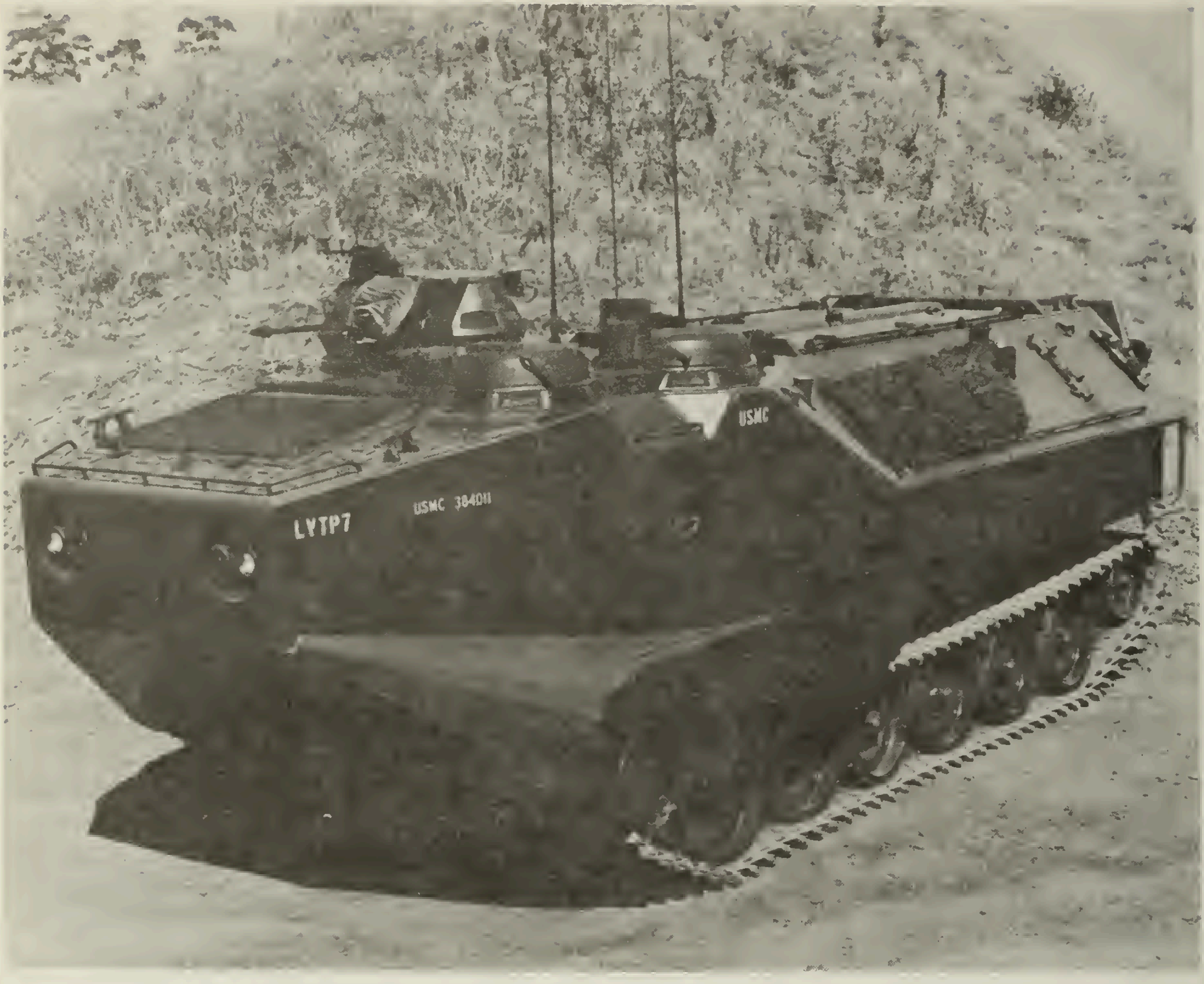


Figure 23.--Location of Access Hatches on the LVT.

c. Procedures When Amphibious Vehicle Has Sunk.--The current series of LVT's are the most seaworthy ever constructed. Even so, under certain circumstances, rapid vehicle sinkings may occur making it impossible to evacuate passengers before the vehicle slips under the surface of the water. Should this happen, a percentage of air will be trapped in the troop compartment forming an air pocket which is sought out by all aboard. Hatches cannot be opened until internal and external pressures have equalized. At this time, all hatches possible should be opened and used to escape. Life preservers should be inflated only after leaving the vehicle. If the vehicle settles in the surf zone and is completely grounded where depth of water and wave action do not create a buoyant effect, passengers and crew should abandon the vehicle in pairs over the side in a direction that is parallel to the beach but not to leeward of the vehicle. Should the vehicle remain buoyant due to action of the waves in the surf zone, passengers and crew should await recovery by another amphibious vehicle and not attempt abandonment of the vehicle. It is the responsibility of the vehicle commander to ensure that all troops embarking aboard his vehicle know the safety procedures, evacuation procedures, escape routes, and the proper wearing and operation of the life preserver.

1808. DISTRESS SIGNALS FOR AMPHIBIOUS VEHICLES

When a vehicle becomes disabled in the water, the crew chief exerts every effort to correct the cause of the disability after ensuring the safety of the passengers. When it is apparent that the vehicle is sinking or that repairs cannot be effected with personnel and equipment on hand, the crew chief signals for assistance. Distress signals to be used are:

a. Sinking, Day or Night.--Fire a double-star red signal flare from a pyrotechnic projector into the air over the vehicle. Wave the letter "N" flag vigorously during daylight. Flash headlights on and off.

b. Disabled, Day.--Display the letter "N" flag (blue and white checked) from a boat hook held in a vertical position.

c. Disabled, Night.--Employ spotlights and battle lantern beamed vertically into the air. During darkness, the distress signal for sinking (red-red star) is fired if the crew chief believes that there is a possibility of sinking or that the vehicle cannot be assisted.

1809. SURFING AND WATERBORNE CRITERIA FOR THE LVT

LVT's possess excellent surfing characteristics. They are capable of negotiating plunging breakers in excess of 10 feet and operating efficiently in sea state 3 (3- to 5-foot waves). Planning for combat operations should be predicated on the demonstrated capability of negotiating 10-foot plunging waves in combat loaded and troop loaded conditions and 8-foot

LOAD	MAXIMUM SURF HEIGHT	WAVE PERIOD (NOT LESS THAN)
100 Percent Plunging Surf		
CL	6 Feet	9 Seconds
TL	6 Feet	9 Seconds
CE	6 Feet	13 Seconds
50 Percent Plunging Surf, 50 Percent Spilling Surf		
CL	6 Feet	8 Seconds
TL	6 Feet	8 Seconds
CE	6 Feet	10 Seconds
100 Percent Spilling Surf		
CL	6 Feet	5 Seconds
TL	6 Feet	5 Seconds
CE	6 Feet	7 Seconds

Figure 24.--Maximum Surf Conditions for Training Operations.

plunging waves in the combat equipped condition. However, for purposes of training both crews and embarked personnel, limitations are imposed on the scope of vehicular operation to provide a greater degree of safety. See FMFM 2-1, Intelligence, for a complete description of surf conditions.

a. Maximum Surf Conditions for Training Operations.--The criteria listed in figure 24 is based on three load conditions: combat load (CL) (10,000 pounds), troop load (TL) (5,600 pounds), and combat equipped (CE) (no load).

b. Vehicular and Personnel Considerations.--Movement over an excessive distance at sea and remaining afloat for long periods of time increase the possibility of mechanical breakdown, crew and passenger fatigue, and seasickness. Time afloat should be kept to a minimum consistent with the following recommended maximum distances for LVT movement while waterborne:

(1) Line of departure to beach: 2,750 meters.

(2) Ship to line of departure: 1,000 meters. During periods of reduced visibility, the distance from the line of departure to the beach is reduced to 1,000 meters, if possible.

1810. OPERATING SPEED AND DISTANCE

Amphibious vehicles, in particular those of the LVT series, are restricted in operating speed and the distance which must be maintained between vehicles. These restrictions are necessary due to restricted vision from within and the responsibility for the safety and welfare of personnel in the area of vehicle operations.

a. Operating Speed and Distance While Waterborne.--Amphibious vehicles afloat maintain a distance of at least 30 meters during periods of unrestricted visibility. In operations at night or under conditions of reduced visibility, this distance is 30 meters or the limit of visibility, whichever is less. Vehicles are authorized to operate at maximum speed while waterborne; however, the speed of the vehicle is influenced by the proximity of other craft.

b. Operating Speed and Distance Ashore.--During periods of daylight and unrestricted visibility, vehicles maintain an interval of 50 meters. At night and during periods of reduced visibility, the distance is 50 meters or the limit of visibility, whichever is less. When operating in congested areas ashore, vehicle speed is always slow enough to permit stopping within the limits of visibility. When vehicles find it necessary to enter a bivouac area at night, they are halted at the entrance to the bivouac. The amphibious vehicle unit commander then arranges to have all troops in the area awakened, on their feet, and warned of the entry of amphibious vehicles. He will under no circumstances permit the vehicles to enter a bivouac area until assured by competent authority that this has been accomplished. Amphibious vehicles, each escorted by one guide with a flashlight, then enter the area at a speed of no more than 5 miles per hour.

1811. BEACH RESCUE TEAMS

During surf and waterborne operations conducted by amphibious vehicle units as training exercises, a beach rescue team is formed. Recommended composition of the beach rescue team is as follows:

a. Composition of Beach Rescue Team for LVT Operations

(1) Two LVTP's or one LVTP and one LVTR.

(2) Normal crews for the vehicles.

(3) Three expert swimmers per vehicle, exclusive of the crew.

(4) At least one ring-buoy with 50 feet of line attached for each rescue vehicle.

(5) Heaving lines and a matched set of nylon towing lines, 40 feet in length, with an 18-inch eye at each end.

(6) One hospital corpsman.

(7) An officer or NCO in charge.

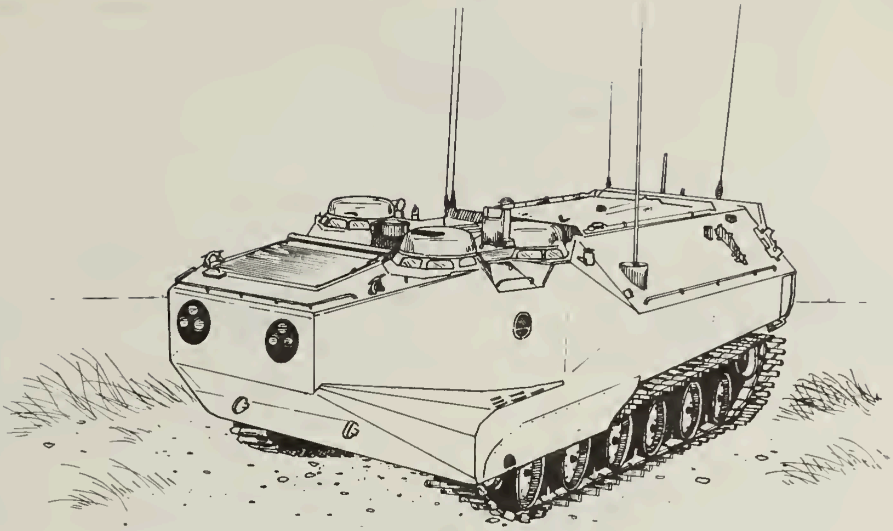
(8) One 4x4 cargo vehicle with driver.

(9) One jeep-mounted radio, compatible with radios contained in the operating amphibious vehicles, with radio operator.

(10) One resuscitator.

(11) One 4x4 ambulance with driver.

b. Action of the Beach Rescue Team.--Beach rescue team operations are conducted under the control of the senior amphibious vehicle officer present; while their principal mission is the rescue of disabled vehicles in the surf zone, they may be employed elsewhere as the situation dictates. The initial aim of beach rescue team operations is rescue of embarked passengers and the vehicle crew. They may subsequently assist in recovery of vehicles, time and the situation permitting. Appendix R lists procedures for rescue of disabled LVT's.



CHAPTER 2

ORGANIZATION AND UTILIZATION OF THE ASSAULT AMPHIBIAN BATTALION

Section I. GENERAL

2101. INTRODUCTION

Assault amphibian battalions are organic units of force troops, Fleet Marine Force. Present organizational strength policies dictate that one assault amphibian battalion be maintained for support of each Marine division. Others could be activated or existing battalions strengthened as required in emergencies or general mobilizations.

2102. MISSION

To land the surface assault elements of the landing force and their equipment in a single lift from assault shipping during amphibious operations to inland objectives; to conduct mechanized operations and related combat support in subsequent operations ashore.

2103. ORGANIZATION

A standard assault amphibian battalion is composed of a headquarters and service (H&S) company and four assault amphibian companies. The assault amphibian battalion (light) has an H&S company and only two letter companies (see figs. 25 and 26).

2104. ORGANIZATION OF THE HEADQUARTERS AND SERVICE COMPANY

H&S company provides command, administrative, maintenance, and organic supply support for the battalion. (See fig. 27.)

a. Battalion Headquarters.--Battalion headquarters includes the battalion commander, his executive officer, and normal staff members.

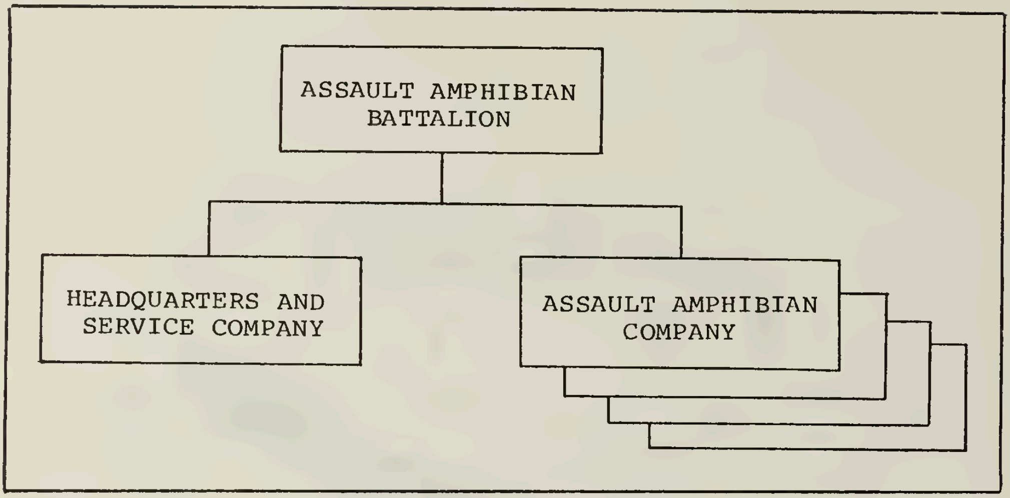

ASSAULT AMPHIBIAN BATTALION
HEADQUARTERS AND SERVICE COMPANY
ASSAULT AMPHIBIAN COMPANY

Figure 25.--Organization of the Standard Assault Amphibian Battalion.

b. Medical Section.--The medical section includes all medical personnel organic to the battalion. These personnel are familiar with the capabilities and limitations of the amphibious tractor in addition to their medical qualifications. They are able to advise on the employment of the LVT as a mobile aid station and as a casualty evacuation vehicle and can man them as required in the accomplishment of such missions.

c. Chaplain Section.--The chaplain section is responsible for the spiritual welfare of the battalion.

d. Motor Transport Section.--A motor transport section is provided and is responsible for operation and maintenance of all wheeled vehicles other than those authorized the companies.

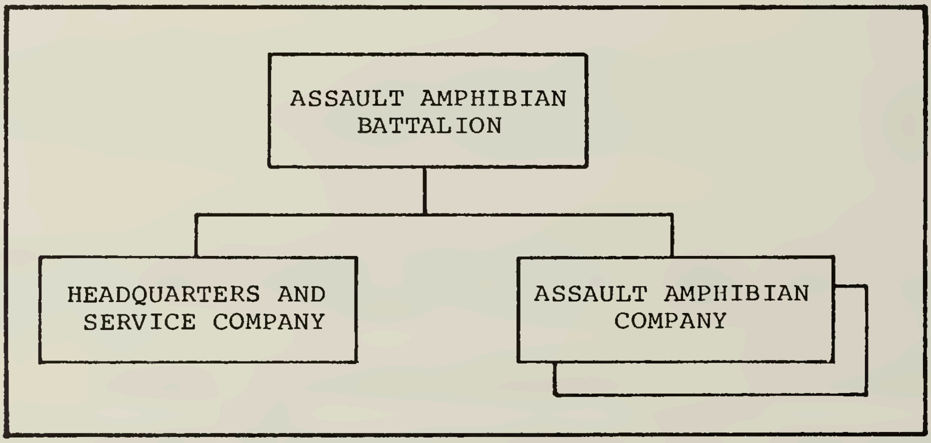

ASSAULT AMPHIBIAN BATTALION
HEADQUARTERS AND SERVICE COMPANY
ASSAULT AMPHIBIAN COMPANY

Figure 26.--Organization of the Assault Amphibian Battalion (Light).

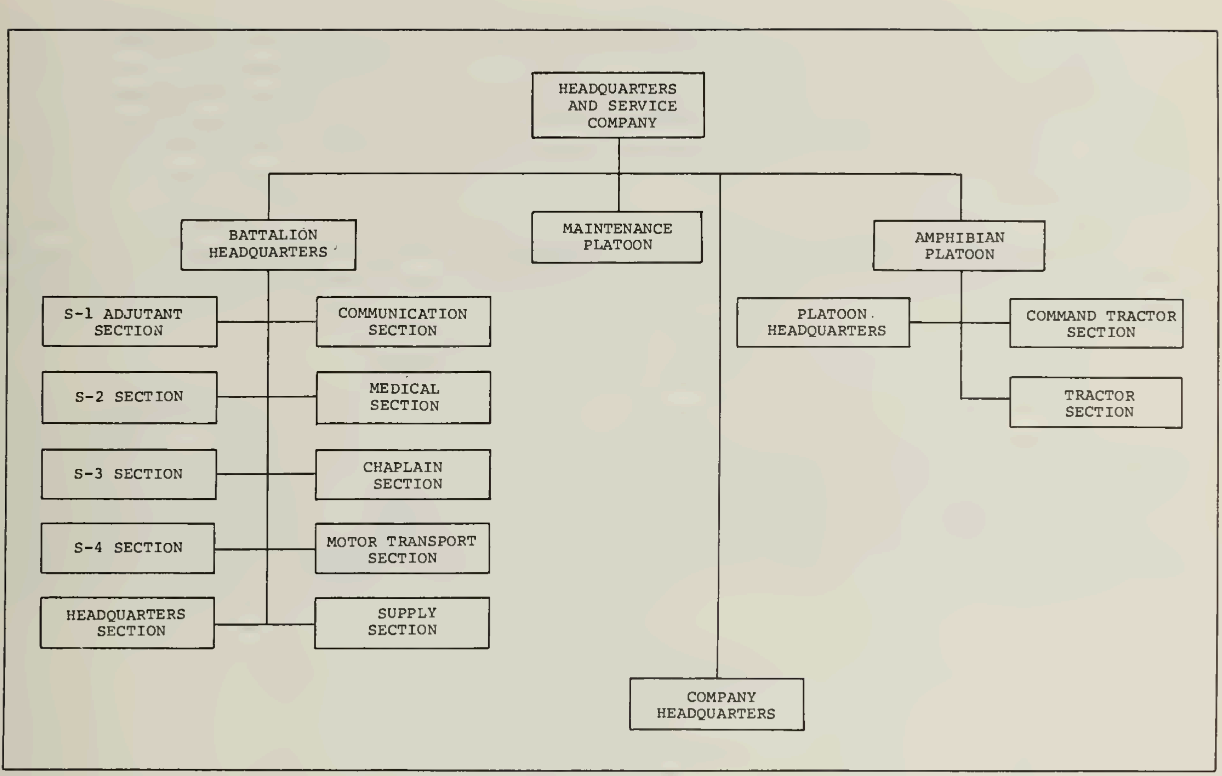


Figure 27.--Organization of the Headquarters and Service Company, Assault Amphibian Battalion.

e. Communication Section.--The communication section installs, operates, and maintains the communication system for the battalion headquarters. The section is responsible for repairs through second echelon to all communication equipment organic to the battalion headquarters.

f. Supply Section.--The supply section includes the majority of supply personnel organic to the battalion and provides supply support for all units.

g. Maintenance Platoon.--The battalion maintenance platoon is responsible for organizational maintenance to include third echelon maintenance of all tracked vehicles within the battalion. See section VI, this chapter, for third echelon capability. The H&S company maintenance platoon in a standard battalion has two LVTR's while that of a light battalion has one.

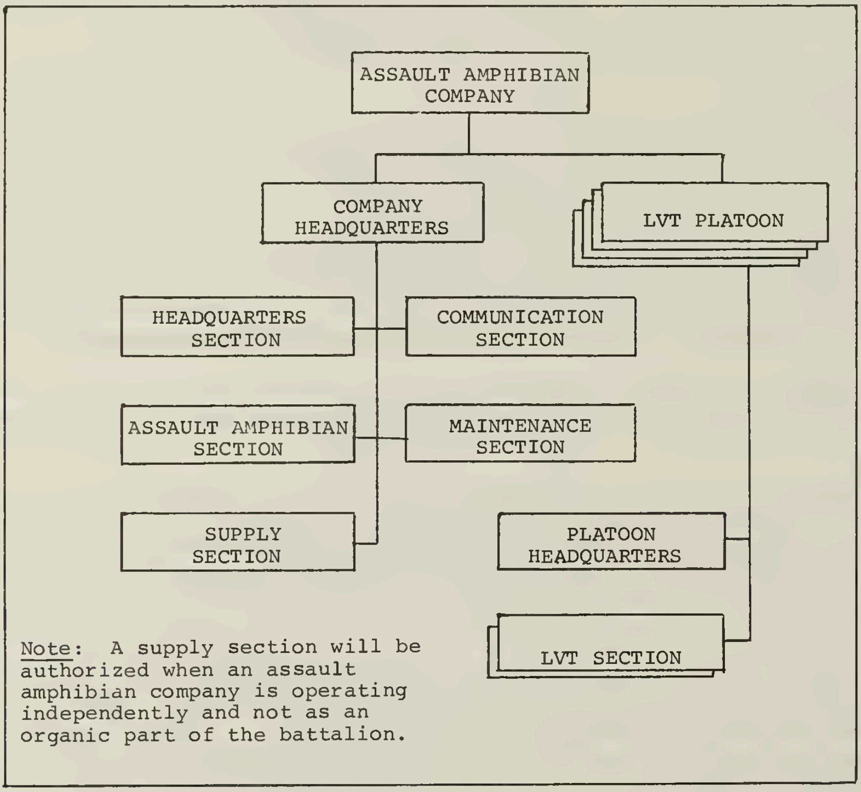
h. Assault Amphibian Platoon.--This unit comprises three sections: a headquarters, a command tractor section, and a tractor section. The headquarters unit has normal command responsibilities. The command tractor section operates three LVTC vehicles. The assets are principally used to provide internal logistics support to the assault amphibian battalion. Two LVTC's can be provided to supported units when not required to support the battalion, with the third LVTC used for internal communication requirements.

The tractor section includes 15 LVTP vehicles, intended for employment appropriate to the tactical situation. These vehicles may be made available to supported units during the conduct of a landing or subsequent movement inland if adequate boat spaces are not available in assault amphibian company vehicles. When not required by supported units, they are principally employed to provide internal logistic support for the assault amphibian battalion.

i. Company Headquarters, H&S Company.--This headquarters is responsible for the internal administrative and logistic functioning of the H&S company.

2105. ORGANIZATION OF THE ASSAULT AMPHIBIAN COMPANY

Each assault amphibian company contains four assault amphibian platoons of two sections each, together with headquarters, assault amphibian, communication, and maintenance sections. (See fig. 28.) The communication section provides radio operators for internal company command nets and possesses a repair capability through second echelon. The maintenance section accomplishes second echelon maintenance on amphibious tractors and assigned motor transport. Assistance in the conduct of third echelon maintenance is furnished by the battalion maintenance platoon.



Note: A supply section will be authorized when an assault amphibian company is operating independently and not as an organic part of the battalion.

Figure 28.--Organization of Assault Amphibian Company, Assault Amphibian Battalion.

2106. CHARACTERISTICS OF THE AMPHIBIOUS VEHICLE

The LVTP is an armored assault, amphibious, full-tracked landing vehicle constructed of welded aluminum armor plate. Appendix A has a detailed listing of the characteristics and capabilities of the LVTP. As a personnel carrier, it holds 25 men in the personnel compartment plus a crew of three and the troop commander forward. Duties of crewmembers are described in appendix S. The vehicle is armed with a turret mounted .50 caliber M85 machinegun. The armament station is powered by an electric-hydraulic system. Overhead cargo doors are provided for loading and unloading cargo by boom or crane. A watertight ramp forms the stern of the vehicle and is used for loading and unloading personnel and cargo.

2107. ALLOCATION OF AMPHIBIOUS VEHICLES WITHIN THE ASSAULT AMPHIBIAN BATTALIONS

Assault amphibian battalions are distinguished by either the standard organization of an H&S company and four letter companies with a total of 208 tracked vehicles or are organized as a light battalion containing an H&S company and two letter companies with a total of 107 tracked vehicles. They are allocated as follows:

a. Headquarters and Service Company

(1) Standard: Fifteen LVTP (personnel).
Light: Ten LVTP (personnel).

(2) Standard: Three LVTC7 (command).
Light: Two LVTC7 (command).

(3) Standard: Two LVTR (recovery).
Light: One LVTR (recovery).

b. Each Assault Amphibian Company

(1) Forty-three LVTP.

(2) Three LVTC.

(3) One LVTR.

c. Allocation to Supported Units.--Units supported by a standard battalion are normally assigned a total of 8 LVTC vehicles (2 from each of the LVT companies) and 160 LVTP's (40 from each LVT company). When supported by a light battalion, the unit being supported is normally allocated a total of 4 LVTC's (2 from each LVT company) and 80 LVTP's (40 from each LVT company). Other amphibious tractors within the battalion are used for command and logistics functions. Certain additional vehicles from H&S company may be made available to supported units as required.

2108. CONSIDERATIONS FOR THE EMPLOYMENT OF THE ASSAULT AMPHIBIAN VEHICLE

During the ship-to-shore movement and subsequent inland phases of amphibious operations, amphibious vehicles are employed to land the surface assault elements of the landing force and their equipment and conduct mechanized operations and related combat support. In employing assault amphibians, the following advantages and disadvantages are considered:

a. Advantages

(1) Crosses reefs, certain types of offshore obstacles, and shallow water which cannot be crossed by landing craft.

(2) Crosses beaches, swamps, ice, snow, and major obstacles impassable to wheeled vehicles.

(3) Able to move from water to land without modification.

(4) Provides some protection for embarked personnel from enemy action (including nuclear effects) and from the weather.

b. Disadvantages

(1) Slow speed afloat.

(2) Requires periodic maintenance.

(3) Reduced visibility with hatches closed.

(4) Vulnerable to mines and fire of heavy enemy weapons.

(5) Difficult to conceal.

2109. AMPHIBIAN VEHICLE UTILIZATION

The three types of amphibian vehicles available to the commander are employed as outlined below. Appendixes A through C contain illustrations of each type of vehicle with a list of its characteristics.

a. LVTP (Personnel)

(1) Personnel Carrier.--Lifts a maximum of 25 combat loaded troops under combat conditions.

(2) Cargo Carrier.--Lifts 5 tons of cargo afloat or ashore. Appendix M sets forth typical cargo loads for the LVTP.

(3) Artillery Prime Mover.--May be used as a prime mover to tow the 105mm and 155mm howitzer while carrying the crew, ammunition, and necessary equipment.

(4) Mobile Command Post.--Provided by using LVTP in conjunction with LVTC vehicle.

(5) Mobile Observation Post.--May be used as a covered mobile observation post.

b. LVTC (Command)

(1) Command vehicle for assault unit and assault amphibian command elements.

(2) Mobile fire support coordination center.

c. LVTR (Recovery).--Recovers and repairs disabled vehicles when ashore and, depending on sea and wind conditions, when waterborne. Provides the principal maintenance capability for mobile assault amphibian units.

Section II. LOADING ABOARD LANDING SHIPS

2201. OFFSHORE LOADING

In organizing for loading, amphibious vehicles and landing craft are provided separate beach areas. Embarking troops are transported to the ship by landing craft rather than amphibious vehicle, if possible. Amphibious vehicles are grouped according to the ship on which they will embark and are then led to that ship by naval guide boats. Loading plans are prepared to ensure that amphibious vehicles will debark in proper sequence for landing. The officer in charge of amphibious vehicles is responsible for ensuring the proper loading sequence.

2202. LOADING ABOARD THE LANDING SHIP TANK (LST)

Techniques for loading the LVTP aboard the LST differ depending on whether or not the LST is equipped with a stern gate. Means of loading the LST with stern gate also vary depending on sea and wind conditions in the loading area. Techniques for each type of loading situation are discussed in the succeeding subparagraphs:

a. In Fair Seas and Good Weather.--Amphibious vehicles are driven aboard forward, turned around, and backed into berthing position.

b. In Rough Seas and/or Foul Weather.--Amphibious vehicles loading aboard LST's in rough seas or during foul weather normally follow the below listed procedures:

(1) Vehicles to be loaded aft of the turntable approach the LST from the front on signal from the approach control officer. Upon signal from the loading officer on the tank deck ramp, about 30 feet from the ramp, amphibious vehicle tracks are placed in water jet and track, plus placed in first gear while embarking.

(2) Ship's line handlers then pass the heaving line with steadying lines attached to an amphibious vehicle crewmember.

(3) The amphibious vehicle crewmember passes the eyes of the steadying lines over the forward mooring bitts of the vehicle so they cross. The eye of one line is normally painted red and is placed over the starboard bitt, ensuring that the lines cross.

(4) The line handlers, on signal from the loading officer, heave the amphibious vehicle to so that the tracks rest securely on the edge of the ramp of the ship.

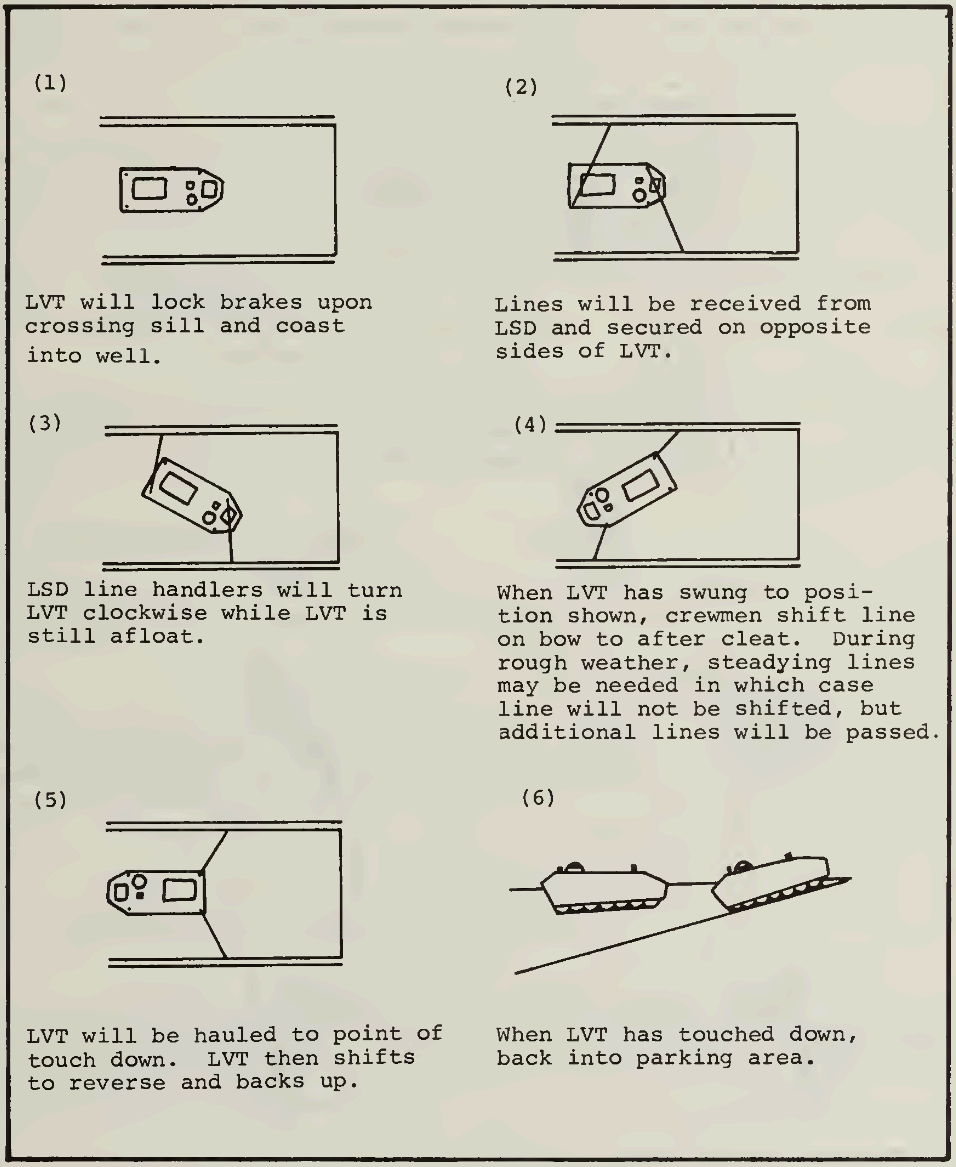
(5) Upon signal from the loading officer, the vehicle is driven up the ramp until "leveled off," stopped, and steadying lines disengaged and cast off.

(6) Vehicles are then driven onto the turntable, turned around, and spotted.

2203. LOADING ABOARD THE LANDING SHIP DOCK (LSD) AND AMPHIBIOUS TRANSPORT DOCK (LPD)

There are three methods for embarking amphibious vehicles aboard an LSD or LPD:

a. In the first method, vehicles approach the ship "bow on" and cross over the sill at the stern gate of the ship. An interval of 50 to 75 meters between vehicles in column is maintained. The LSD is ballasted to approximately 6 feet of water at the sill. The forward portion of the


(1) LVT will lock brakes upon crossing sill and coast into well.

(2) Lines will be received from LSD and secured on opposite sides of LVT.

(3) LSD line handlers will turn LVT clockwise while LVT is still afloat.

(4) When LVT has swung to position shown, crewmen shift line on bow to after cleat. During rough weather, steadying lines may be needed in which case line will not be shifted, but additional lines will be passed.

(5) LVT will be hauled to point of touch down. LVT then shifts to reverse and backs up.

(6) When LVT has touched down, back into parking area.

Figure 29.--Diagram of Embarkation in LSD and LPD.

well deck is dry. After crossing the sill, amphibious vehicle engines are idled and brakes locked. (See fig. 29(1).) Steadying lines are passed to the vehicle by ship's line handlers, as in figure 29(2). The danger of thrown steadying lines is eliminated by suspending the eyes of the lines over the center of the deck by means of heaving lines from the opposite wing walls. The eye of the line from the starboard wing wall is placed over the after starboard mooring bit. Ship's line handlers then swing the vehicle clockwise in a 180-degree arc. (See fig. 29(3).) When the stern of the vehicle is facing forward in the well deck, crewmen shift the steadying line from the port bow mooring bit to the after port mooring bit.

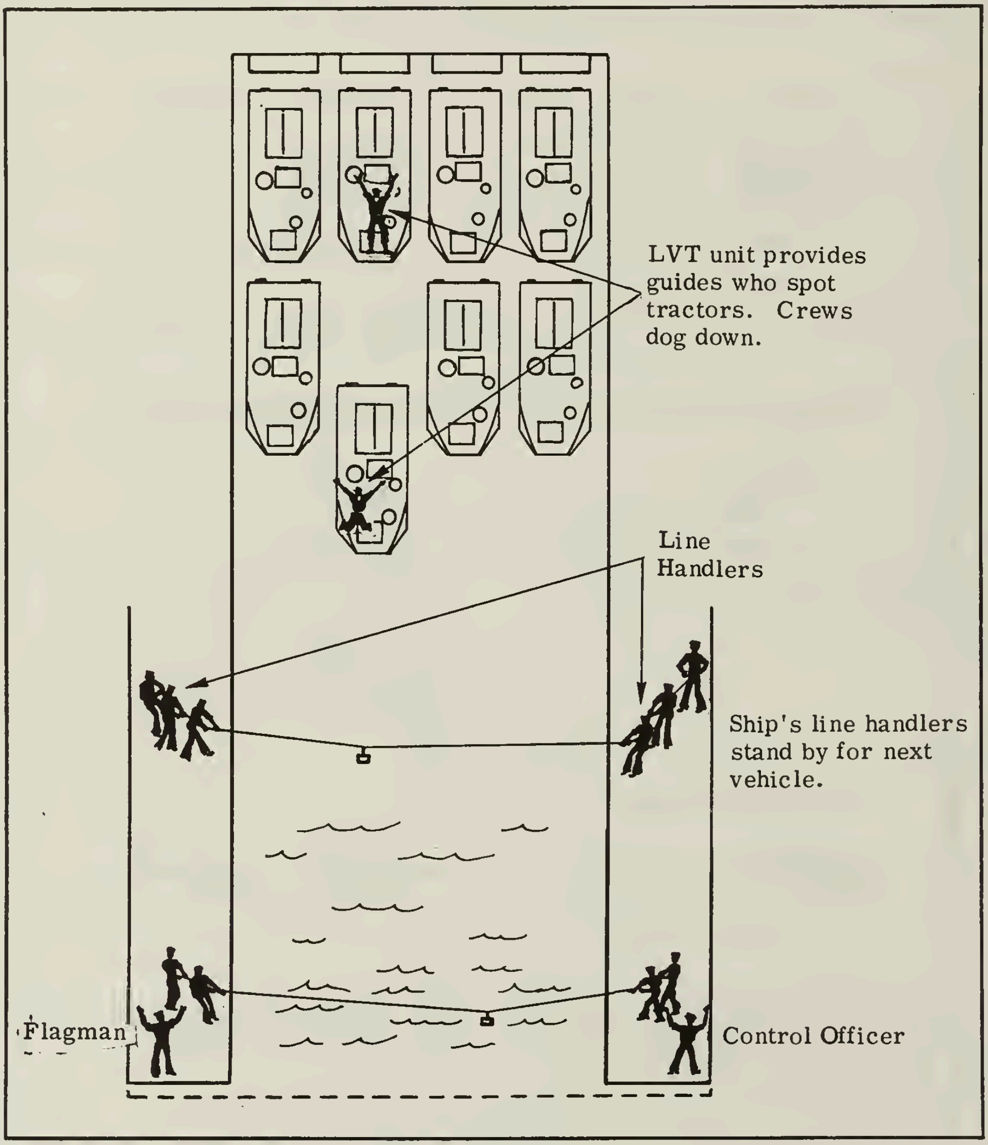

LVT unit provides guides who spot tractors. Crews dog down.
Line Handlers
Ship's line handlers stand by for next vehicle.
Flagman
Control Officer

Figure 30.--LVT Spotted in Well Deck of 28 Class LSD.

(See fig. 29(4).) The vehicle is then pulled forward until it grounds on the ship's deck. (See fig. 29(5).) Once grounded, lines are cast off, and amphibious vehicles move to designated berthing spaces. (See figs. 29(6) and 30.) Vehicles are secured by dogging with chains and turnbuckles furnished by the ship.

b. In the second method, the vehicle approaches the ship "bow on." After crossing the sill at the stern gate, the LVT proceeds at low speed into the well deck. When the compensating idler touches the well deck the driver puts the vehicle into pivot and applies a "pivot steer" through 180 degrees. He then backs the LVT into position directed by a guide using hand signals. This is the fastest and easiest of the three methods and should always be used in rough water.

c. The third method is the slowest and least desirable of the three. The vehicle approaches the ship "bow on." Approximately 15 to 20 meters before reaching the stern gate, the driver turns the vehicle around and backs it into the ship. This method should only be used in calm water. It is a slow method and is hard on the vehicle's transmission.

2204. LOADING ABOARD THE GENERAL PURPOSE AMPHIBIOUS ASSAULT SHIP (LHA)

There are two methods for embarking amphibious vehicles aboard an LHA:

a. Embarking at Pierside.--Amphibious vehicles may be driven over a ramp which has been placed from the shore facility wharf. The ramp may either be directly from the pier or from the pier to a barge then to the stern opening of the ship.

b. Embarking at Anchorage

(1) LVT's usually will be loaded after all other scheduled cargo and vehicles have been loaded through the well deck.

(2) When the ship receives LVT's, it is ballasted to approximately 7 feet of water at the sill. As the LVT's enter, a line is passed to the bow of the LVT by the line delivery system on one side of the aft well; another line is passed to the stern of the LVT from the opposite side of the well. The lines are placed on the forward and aft cleats of the LVT. The line handling winch operators haul in the lines, spinning the LVT 180 degrees. The LVT then backs into its designated position in the well deck.

(3) In the case of a maximum load of LVT's in the well, the last three LVT's must back into the well. Under these conditions, the well is ballasted to approximately 5 feet at the sill.

(4) In a more typical situation, only a few amphibious vehicles are brought aboard and stowed on the third deck, after which the well deck is filled with landing craft. In this situation, the LVT's enter the well and proceed directly to the third deck, turn around, and back into their designated stowage positions.

Section III. OPERATIONS ASHORE DURING UNLOADING

2301. GENERAL

The dual nature of the amphibious tractor provides the commander landing force with a flexible, diversified vehicle throughout the course of the amphibious operation. When the assault landing is completed, amphibious vehicles may be employed to provide lift for logistics requirements.

2302. ESTABLISHMENT OF FACILITIES ASHORE

The command post, with its maintenance and supply facilities for amphibious vehicle units ashore, is located proximate to the supported unit whenever possible. Extensive areas are required to provide for proper dispersion of vehicles and conduct of maintenance. Therefore, detailed reconnaissance of proposed sites is necessary to ensure availability of an adequate installation. The commander of the area in which the installation is to be located approves the proposed amphibious vehicle unit locations.

2303. CONTROL OF OPERATIONS ASHORE

Amphibious vehicles operating ashore rely on radio as their primary means of control. Secondary means include visual and sound amplification systems. Visual inshore markers control movement of vehicles on the beach. Guides are employed where required. These control measures are initiated and supervised by the shore party. Small boat signals may be employed ashore as well as afloat. Common hydrographic markings, beach markers, unloading point markings, and other beach signals are illustrated in appendix T and in NWP 22-3, Ship-to-Shore Movement. Specific points are established on the beach where amphibious vehicles enter and leave the water while based ashore. It is desirable that these points be within view of the ships being unloaded by amphibious vehicles. Amphibious vehicle control personnel, with communication equipment, are stationed at each such checkpoint to dispatch vehicles. The duties of these control personnel include:

a. Establishing and maintaining liaison with the shore party.

b. Directing amphibious vehicles to the proper ship or destination.

c. Maintaining records of vehicle movement and amounts of cargo hauled.

d. Maintaining required communications.

e. Advising the shore party with regard to operating conditions affecting amphibious vehicle employment; e.g., wind, surf conditions, and currents.

2304. UNLOADING SHIPS

a. Amphibious vehicles possess a ship unloading capability and have the following advantages over landing craft in accomplishing this mission:

(1) Trips from ship to shore are not interrupted by reefs or other offshore obstacles.

(2) Retraction problems caused by tidal conditions are avoided.

(3) Cargo can be lifted by one carrier from the ship to inland points.

(4) Unloading of ramp-type ships in shallow water is facilitated.

b. Disadvantages of employing amphibious vehicles to unload ships include:

(1) Amphibious vehicles are slower than landing craft.

(2) They require more maintenance.

(3) There is more restriction on the size of cargo due to the configuration of the vehicle.

2305. UNLOADING LANDING SHIPS NOT BEACHED

A landing ship may be unloaded advantageously by amphibious vehicles if it lies close inshore. Loading may be accomplished alongside the ship by means of nets and cranes. This can also be accomplished by embarking vehicles over the ramp of the LST or sill of the LPD/LSD and loading them while on board.

2306. UNLOADING LPA'S AND LKA'S

Amphibious vehicles are not well suited for unloading LPA and LKA types of ships because of the distance at which they normally anchor from shore and the difficulty of maneuvering alongside.

2307. LIAISON WITH THE SHIP

Amphibious vehicle units directed to conduct unloading operations with a ship send a liaison party with communication equipment aboard the ship prior to commencing operations. The duties of the liaison party include:

a. Advising the ship's combat cargo officer and the debarkation officer on matters of LVT employment.

b. Advising and assisting in handling of vehicles at the ship.

c. Informing beach checkpoint personnel and amphibious vehicle command post of details regarding unloading.

d. Reporting operational delays and their causes to amphibious vehicle control points.

e. Advising as to proper vehicle loads for the existing weather and surf conditions.

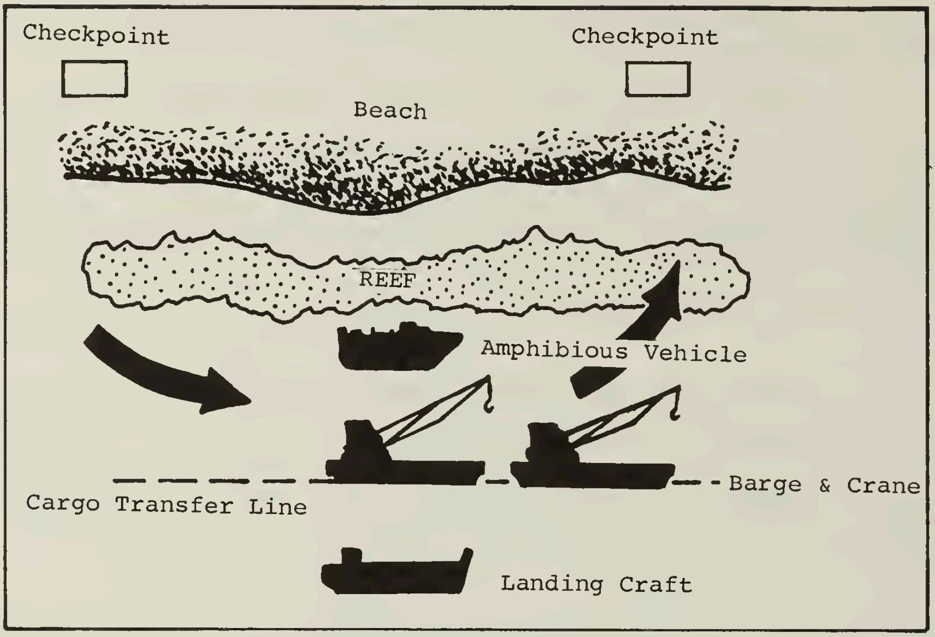


Figure 31.--Organization of the Cargo Transfer Line.

2308. CARGO TRANSFER LINE

When landing craft are employed in unloading ships, or when landing ships are to be unloaded and a fringing reef exists seaward of the beach, a cargo transfer line is established. The line is generally located just seaward of the reef. Operations at the cargo transfer line are controlled by the naval control organization. The unrestricted use of amphibious vehicles across fringing reefs and other offshore obstacles affords them a vital role when cargo transfer operations are required. Organization of a typical cargo transfer line is illustrated in figure 31. It is desirable to restrict all movement seaward of barges and cranes at the transfer line to landing craft and all areas landward for amphibious vehicles. Landing craft discharge their loads to barges which generally use cranes for loading amphibious vehicles for the movement to the beach. Checkpoints are used to release amphibious vehicles to the cargo transfer line as outlined in paragraph 2303.

Section IV. COMMUNICATIONS IN THE ASSAULT AMPHIBIAN BATTALION

2401. GENERAL

Amphibious vehicle units are heavily dependent upon voice radio in controlling and employing their vehicles. Restricted vision and excessive noise from within the vehicle render other communication methods undependable when the vehicles are "buttoned up." Amphibious vehicle units also furnish mobile command posts, fire support coordination centers, and observation posts through employment of the LVTC with its extensive communication potential. Each LVT unit conducts extensive training in the use of voice radio equipment and radio procedure for purpose of internal control. The command vehicles located in assault amphibian companies and the H&S company of each assault amphibian battalion are maintained by the LVT units ensuring that they are ready for use by communication personnel of the embarked units. A description of radio sets used by the assault amphibian battalion including their ranges and frequencies is found in appendix O.

2402. ORGANIZATION OF COMMUNICATIONS

The majority of the communication personnel organic to the battalion are located in the communication section of the H&S company. This section is responsible for installation and maintenance of battalion communications, and for assistance in the conduct of second echelon maintenance on equipment located in the companies. Each assault amphibian company has sufficient radio operators and repairmen to man the company command voice nets and maintain all radios. In addition, a small complement of field radio operators is provided to train the amphibious vehicle crewmen in communication procedures.

2403. INTERNAL RADIO COMMUNICATIONS

Sufficient nets are activated within the battalion to provide for positive control of each unit. The following nets are normally established:

a. Battalion Command Net.--This net is used by the battalion commander as his means of overall control. The battalion command net is entered by the battalion command post, company command posts, amphibian platoon of H&S company, and battalion recovery vehicle.

b. Company Command Net.--This net is used by each assault amphibian company commander as his means of controlling the movements of his unit. This net is normally entered by the company command post, all vehicles within the company, and all LVTR's attached to or in support of the company.

c. Platoon Command Net.--When sufficient frequencies are available, or the tactical situation requires, platoon command nets are activated and entered by all vehicles within the platoon, including those vehicles attached.

2404. EXTERNAL RADIO COMMUNICATIONS

a. Communications to Higher Headquarters.--The radio communication requirements of the assault amphibian battalion when operating subordinate to the MAF or division are discussed in FMFM 10-1, Communications.

b. Communications With Supported Units.--Communications with a supported unit will be as directed by the supported unit. This will generally be by one or two methods:

(1) Liaison teams may be sent to the supported unit headquarters by the amphibious vehicle unit. This team, which has its own communication equipment, establishes a station on the amphibious vehicle unit command net.

(2) The amphibious vehicle unit may be directed to establish a station on the supported unit's tactical net.

2405. COMMUNICATIONS FOR EMBARKED UNITS

Embarked units utilize the radio equipment installed in the LVTP and LVTC for their use.

a. Within the LVTP.--Equipment installed for embarked troop use in the LVTP will provide the capability for operating on one net in the VHF-FM frequency band.

b. Within the LVTC.--Equipment installed in the LVTC for embarked troop use will provide the following capabilities:

(1) Operating on five nets in the VHF-FM frequency band.

(2) Operating on one net in the HF band.

(3) Operating on one net in the UHF band.

2406. OTHER MEANS OF COMMUNICATIONS

a. Wire.--The major use of wire in the assault amphibian battalion is within the battalion CP to provide local telephone service. When the situation is sufficiently static, wire lines to higher headquarters and subordinate units will be installed.

b. Messengers.--Messengers may be used to supplement other means of communication or in lieu of other means. External messenger service will be as directed by higher headquarters. Internal messenger service may be established when required, particularly in static situations. For a discussion of types of messenger service, see FMFM 10-1, Communications.

c. Visual and Sound.--The use of visual communications in amphibious vehicle units is extensive. They are particularly useful in the ship-to-shore movement. See appendixes L and T for various visual systems that are used. For a discussion of the various means of visual communications, see FMFM 10-1, Communications. Due to the inherent noise conditions in amphibious vehicle units, sound communications will be useful primarily in static situations.

Section V. MAINTENANCE IN THE ASSAULT AMPHIBIAN BATTALION

2501. GENERAL

Maintenance is defined as any action taken to keep material in a serviceable condition or restore it to serviceability when it is unserviceable. The objective of all maintenance is the detection, isolation, and correction of incipient mechanical and electrical failures through timely preventive maintenance services and frequent inspections. Maintenance includes inspections, repair, testing, servicing, modification, and evacuation of vehicles. High vehicle availability rates, the objective of any maintenance program, are the result of continuing command supervision at all levels of the unit's maintenance program. This supervision has as its objective the establishment of timely crew maintenance at the first echelon, and technical maintenance by specialists assigned to the unit at the second echelon. These personnel and facilities are augmented as necessary by mobile maintenance teams from support activities. Commanders at all echelons ensure that trained maintenance personnel are constantly available to operating amphibious vehicle units in proportion to the number of vehicles committed.

2502. CATEGORIES OF MAINTENANCE

Maintenance performed at the first or second echelon is described as organizational maintenance and may be performed by the unit on its own vehicles and equipment. Field maintenance, that performed at the third and fourth echelon, is authorized to be performed by designated maintenance units organic to or in support of the landing force. Depot maintenance, or fifth echelon, is that maintenance required for the repair of material which requires a major overhaul or complete rebuild of parts, subassemblies, assemblies, and/or end items, as required. Each maintenance echelon performs any of the maintenance functions of lower echelons when required. Repairs are performed in the lowest echelon of maintenance consistent with the nature of repair, authorized repair parts, tools, equipment, time available, capabilities of personnel, and the tactical situation.

a. Organizational Maintenance.--Organizational maintenance is that maintenance authorized an amphibious vehicle unit for its own equipment. This maintenance normally consists of inspecting, cleaning, servicing, preserving, lubricating, and adjusting equipment, as required. It also may consist of minor parts replacement not requiring highly technical skills. This category incorporates first and second echelons of maintenance.

(1) First Echelon Maintenance.--First echelon maintenance is that maintenance performed by the user, wearer, or operator of the equipment and is required to provide proper care, use, operation, cleaning, preservation, and lubrication. It includes such adjustment, minor repair, testing, and parts replacement as may be prescribed by pertinent technical publications and tools and parts allowances. This category of maintenance in the assault amphibian battalion is performed by the amphibious vehicle crew. Appendixes K and S set forth first echelon maintenance duties for LVT crews.

(2) Second Echelon Maintenance.--Second echelon maintenance is performed by specially trained personnel provided for that purpose in the assault amphibian battalions. Appropriate publications authorize the second echelon of maintenance additional tools and necessary parts, supplies, test equipment, and personnel to perform maintenance beyond the capabilities and facilities of the first echelon. Second echelon maintenance in assault amphibian battalions is performed by company and battalion maintenance personnel on vehicles in the assault amphibian companies and H&S company, respectively.

b. Intermediate Maintenance.--Intermediate maintenance is performed by designated supporting maintenance activities. This category is normally limited to maintenance consisting of replacement of unserviceable parts, subassemblies, or assemblies, and incorporates the third and fourth echelons of maintenance.

(1) Third Echelon Maintenance.--Assault amphibian battalions are authorized to perform third echelon maintenance within their capacity with the overflow being assumed by the force service support group. A unit responsible for third echelon maintenance normally provides maintenance support to one or more using organizations. Third echelon maintenance activities are authorized a larger assortment of parts, subassemblies, and assemblies, and more precise tools and test equipment than is provided to lower echelon activities. In special cases, however, third echelon maintenance may be performed by organic maintenance units within the using organization.

(2) Fourth Echelon Maintenance.--Fourth echelon maintenance is performed by units organized as semifixed or permanent shops in order to serve lower maintenance echelons in a geographical area. Fourth echelon maintenance activities are authorized a larger assortment of parts, subassemblies and assemblies, and additional and more precise tools and test equipment than the lower echelons. They may furnish mobile repair crews or reinforcing elements to lower echelons when required. The principal function of fourth echelon maintenance is to repair subassemblies, assemblies, and major items for return to lower echelons. Assault amphibian battalions possess no organic fourth echelon capability, and must be so reinforced or evacuate vehicles requiring such maintenance.

c. Depot/Fifth Echelon Maintenance.--Depot/fifth echelon maintenance is the repair of material which requires a major overhaul or complete rebuild of parts, subassemblies, assemblies, and/or end items. Such maintenance is intended to conserve supplies and replenish stocks of serviceable equipment. Lower level maintenance activities are supported through the use of more extensive shop equipment and personnel of higher technical skill than are available at their level. Depot/fifth echelon maintenance constitutes the highest echelon of maintenance. It normally supports supply on a scheduled rebuild-and-return-to-stock basis. Fifth echelon operations are scheduled so as to employ production and assembly line methods whenever practicable.

2503. ORGANIZATION OF MAINTENANCE

The maintenance platoon of H&S company is commanded by the battalion maintenance officer, who is also a member of the battalion commander's special staff and is capable of performing third echelon maintenance.

This platoon performs second echelon maintenance on the LVT's assigned to H&S company and assists the maintenance sections of the assault amphibian companies when required. The maintenance section organic to each of the assault amphibian companies is capable of completing most second echelon repairs on tracked vehicles assigned to the company.

2504. MAINTENANCE OFFICER

Maintenance officers at the company and battalion level have an important role in the employment of the amphibious vehicle unit. These officers, as a result of their training and experience, make broad and comprehensive recommendations to the commander in the following areas:

a. Capabilities and limitations of the LVT under conditions of the proposed operation.

b. Spare parts requirements.

c. Fuel, oil, and lubrication requirements, to include seasonal changes.

d. Modification or alteration of vehicles and additional maintenance procedures that may be required prior to commitment in a special operation.

e. Placement of maintenance personnel within the unit to ensure optimum support.

2505. ASSAULT AMPHIBIOUS RECOVERY, LVTR7

The principal vehicle available to battalion maintenance platoon and company maintenance sections is the LVTR. It is employed by maintenance personnel to recover and repair disabled vehicles when ashore and, depending on sea and wind conditions, when waterborne, is used as a platform from which immediate repairs can be accomplished. Two of these vehicles are assigned to the battalion maintenance platoon and one to each of the company maintenance sections. A list of characteristics and an illustration of this vehicle are found in appendix C.

2506. MAINTENANCE INSPECTIONS

All amphibious vehicle commanders are responsible for the conduct of periodic maintenance inspections of vehicles assigned to their units. Inspections are conducted as frequently as the tactical situation permits when units are committed, and on a regular schedule when operating in a training status. Battalion and company maintenance officers and personnel are utilized to assist in inspecting amphibious vehicle units.

a. Nature of Inspection.--Maintenance inspections by amphibious vehicle unit commanders may be formal or informal in nature, as dictated by the situation and desires of the commander.

(1) Formal Inspections.--The formal inspection is an announced inspection of all personnel, vehicles, and vehicular equipment, known as a command maintenance inspection. Units to be formally inspected are instructed in advance with regard to inspection procedure, extent, etc.

Members of the command maintenance inspection team are designated by the commander, who may augment the team with personnel from supporting maintenance activities.

(2) Informal Inspections.--The informal inspection is conducted by the commander in order to determine the adequacy and efficiency of organizational maintenance. It may include all or part of the maintenance facilities, vehicles, personnel, and equipment of his unit. Frequency and procedure of informal inspections are established by the respective commander.

b. Classes of Inspection.--Amphibious vehicle unit maintenance inspections are classed as spot-checks, technical inspections, and preventive maintenance inspections. They may be formal or informal in nature, as directed by the commander.

(1) Spot-Check Inspection.--This class of inspection is ordered to determine the adequacy and effectiveness of organizational maintenance. It is conducted by commanders or technically qualified personnel designated by the commander, usually organizational maintenance teams from the battalion maintenance platoon or company maintenance section. Spot-checks may be used by commanders visiting subordinate units.

(2) Technical Inspection.--The technical inspection is performed in the battalion maintenance shop on vehicles requiring repairs. It is normally performed by battalion maintenance personnel. On completion of repairs, a copy of the inspection report is provided the unit to whom the vehicle is returned. Technical inspections, encompassing broad aspects of the state of maintenance in amphibious vehicle units, and extremely thorough in nature, are scheduled by commanders who have amphibious vehicle units assigned. Technical inspection teams are designated from qualified and available personnel and are appointed by the commander conducting the inspection.

(3) Preventive Maintenance Inspection.--The preventive maintenance inspection is a scheduled inspection conducted by the crew or by maintenance personnel. The inspection is conducted on each vehicle and item of maintenance equipment in the unit in accordance with technical publications. During this class of inspection, servicing of the equipment and immediate correction of deficiencies are accomplished. In addition to scheduled preventive maintenance inspections, spot-check inspections of one or more vehicles by platoon commanders and section leaders are conducted to determine the effectiveness of preventive maintenance.

c. Commander's Checklist for Inspection.--The tables of manpower requirements for amphibious vehicle units contain lists of technical personnel responsible for the planning, conducting, and inspection of all maintenance conducted in the unit. Assignment of these personnel does not relieve amphibious vehicle unit commanders of responsibility for individual assessment of the effectiveness of maintenance in their units. Compilation of a commander's checklist for maintenance inspections, to include track and suspension system, engineer compartment, crew and cargo compartment, driver and crew chief stations, turret, and exterior of the vehicle should be accomplished. Such ckecklists may be compiled by each unit commander and his maintenance officer from technical publications.

2507. MAINTENANCE SCHEDULES

Regular maintenance schedules for all amphibious vehicles in the battalion are prepared and published by each unit. These schedules are dependent upon the unit's operating environment, state of training, and availability of facilities and technical personnel. They are based on data contained in technical publications pertaining to the vehicle. Maintenance schedules are necessarily flexible, particularly under combat conditions, but are adhered to as closely as possible to ensure maximum vehicle availability rates. Maintenance schedules and instructions are revised when units are operating in unusual environments. Examples of such operations are extended waterborne employment to unload ships, desert operations, jungle operations, and arctic operations with a mechanized force. See chapter 1, section V, for a discussion of maintenance considerations applicable to amphibious vehicles which are operating in special environments.

Section VI. EMPLOYMENT OF THE LVTC7

2601. GENERAL

The LVTC7 is organic to both the headquarters and service company and the assault amphibian company of the assault amphibian battalion. The vehicle is configured to provide communication support to the ground commander at the RLT and BLT levels during the ship-to-shore movement and subsequent operations ashore.

2602. MISSION AND EMPLOYMENT

a. Mission.--The mission of the assault amphibian battalion includes tactical and logistics support. Inherent in tactical support is communication support, which is provided by the LVTC7.

b. Employment.--The LVTC7 can be employed as a mobile command post, fire support coordination center, or fire direction center.

2603. ALLOCATION OF LVTC7 IN THE ASSAULT AMPHIBIAN BATTALION

a. Headquarters and Service Company.--There are three LVTC7's in the headquarters assault amphibian platoon of the four-company battalion, and two LVTC7's in the headquarters assault amphibian platoon of the two-company battalion.

b. Assault Amphibian Company.--Assault amphibian companies are identical in both the two- and four-company battalions. Each company contains three LVTC7's in the company headquarters.

2604. COMMAND RELATIONSHIPS

An assault amphibian platoon has no organic LVTC7's, and when deployed with or otherwise in support of a BLT, normally has one or more of the vehicles assigned. As such, the LVTC7 crew(s) are under the command of the assault amphibian platoon commander. When assault amphibian companies are deployed or otherwise in support of a ground unit, the assault amphibian company commander commands his organic LVTC7's.

2605. SUPPLY AND MAINTENANCE

The supply function is the responsibility of the assault amphibian platoon or company commander. Vehicle first echelon maintenance is the responsibility of the vehicle crew. Second echelon vehicle maintenance is provided at the assault amphibian company level, and the deployed platoon is normally assigned one or more tracked vehicle maintenance men. The crew is responsible for the first echelon communication equipment maintenance only on vehicle radios. First and second echelon maintenance of the command communication equipment and second echelon maintenance of vehicle radios aboard the LVTC7 is the responsibility of assigned ocmmunication and communication maintenance personnel. During deployments, necessary communication and communication maintenance personnel are assigned to platoons is support of BLT's and/or RLT's.

2606. VEHICLE CHARACTERISTICS

The LVTC7 is built on the basic hull of the LVTP7. The two major differences are that the auxiliary station replaces the LVTP7's weapons station and the internal arrangement of the LVTC7 allows for six command communication stations on the port side, and four staff stations on the starboard side. The vehicle crew consists of the vehicle commander, the driver, and the assistant driver. The communication compartment can accommodate the support unit commander, three staff personnel, and five radio operators. See appendix B for detailed vehicle characteristics.

2607. VEHICLE CAPABILITIES AND LIMITATIONS

a. Capabilities

(1) Command and Communication Equipment

(a) The command communcation equipment aboard the LVTC7 allows the supported commander to monitor the eight receivers or transmit on five of the six transceivers simultaneously. The radios in the vehicle are:

1 Four VHF-FM receiver-transmitters.

2 Two VHF-FM receivers.

3 One UHF receiver-transmitter.

4 One HF receiver-transmitter.

(b) All radios except the HF set have facilities for voice encryption equipment.

(2) Vehicle Radios.--There are two VHF-FM receivers and one VHF-FM transmitter-receiver, none of which currently has voice encryption equipment, available for crew use.

(3) Intercom.--There are three intercom systems on the LVTC7:

(a) Crew intercom.

(b) Staff intercom.

(c) Radio operator's intercom.

(4) Master Control Station.--The master control station is located in the communication compartment, starboard side. This station allows monitoring of all radio nets, all intercom systems, and transmission over selected nets.

(5) Telephone.--For static situations, there is a 29-line switchboard on the LVTC7. Three lines are prewired to the vehicle staff stations.

b. Limitations

(1) Mobility.--Care must be taken not to exceed radio ranges and to avoid prolonged terrain masking of radio signals because of the vehicle's mobility.

(2) Voice Encryption Equipment.--Neither the vehicle radios nor the HF radio have voice encryption devices.

(3) Antennas.--The large number of antennas and their proximity on the vehicle makes enemy recognition easy and cause performance degradation of the VHF-FM radios. This limitation can be partly overcome by careful frequency planning, time-sharing on VHF-FM radios, and proper use of cover and concealment to avoid enemy recognition.

(4) Augmentation of Organic Equipment.--The LVTC7 was designed to augment, not replace, the supported unit's organic communication system.

2608. PLANNING AND PREPARATION FOR EMPLOYMENT

a. Planning.--Normal staff planning by assault amphibian units and coordination with supported units are required when the LVTC7 is employed. The assault amphibian commander of the supporting unit, and the operations and communication officers of the supported unit coordinate and plan the employment of the LVTC7. Principal planning and considerations include:

(1) Training.

(2) Mission and concept of operations.

(3) Task organization.

(4) Organization for embarkation and landing.

(5) Communication requirements.

  (a) Ship-to-shore movement.

  (b) Operations ashore.

  (c) Frequency planning and management.

  (d) Available communication assets.

(6) Supply and maintenance.

(7) Enemy situation.

(8) Characteristics of the objective area.

b. Training.--Training in the operation of the LVTC7 for the crew, the supported commander and his staff, and radio operators is mandatory for successful employment of the vehicle. The training should include:

(1) Orientation.

(2) Operation of communication equipment.

(3) Communication exercises.

(4) Operational command post and field exercises.

c. Liaison.--Assault amphibian and supported unit commanders should maintain close and continuous liaison during all phases of planning.

2609. ORGANIZATION FOR COMBAT

The assault amphibian company doctrinally supports an RLT and the platoon a BLT; however, the exact organization for combat is determined by the supported unit commander based upon his mission, concept of operations, available assets, the enemy situation, and the nature of the area of operations. Each surface assault BLT and RLT headquarters should be assigned two LVTC7's if assets are available, with BLT's receiving priority. This arrangement allows the commander to use one vehicle as his mobile command post and the other as his mobile fire support coordination center, or both vehicles for "A" and "B" command groups. If the commander has two LVTC7's vice one, he is given a greater degree of flexibility and more mobile communication assets to meet his requirements during the critical ship-to-shore phase of the amphibious assault.

2610. SHIP-TO-SHORE MOVEMENT

a. Command and Control.--The ship-to-shore movement is the most critical period of the amphibious assault, and radio is the primary means of communication during this time. The LVTC7 has the capability to provide required command and control facilities to the BLT and RLT commander during this critical phase. The LVTC7 cannot, however, meet all the BLT or RLT radio requirements and careful consideration should be given to those nets used. Specifically, command nets with higher headquarters and subordinate units, air support, and naval gunfire support nets should be given primary consideration. Only those nets selected as absolutely necessary should be monitored during the ship-to-shore movement. Other nets can be activated once ashore.

b. Escort Vehicle.--Each LVTC7 should have an escort vehicle with it at all times to provide protection, fire support, and to carry additional staff members and maintenance personnel and equipment. Normally an LVTP7 should be assigned this task.

c. Free Boat.--The LVTC7 should be designated a free boat during the ship-to-shore movement.

d. Establishing Organic Communication System Ashore.--The supported commander should establish his organic communication system ashore as soon as possible. The LVTC7 can provide continuous and effective communication while the organic system is being established.

2611. OPERATIONS ASHORE

a. Mechanized Task Force Operations.--The LVTC7 is ideally suited to support mechanized task force operations. It can be effectively used as a mobile command post, fire support coordination center, or fire direction center during these operations. The commander can move forward quickly to seized objectives utilizing the LVTC7. However, as in any other operation, the vehicle is not designed to replace, but to augment the supported unit's organic communication system.

b. Command Post Displacements.--The LVTC7 can be effective during command post displacements. It can be used either as the forward or rear element of a displacing command post. Regardless of how it is used, it is capable of the continuous communications required.

c. Escort Vehicle.--An escort vehicle, normally an LVTP7, is required during operations ashore for the same reasons that one is needed during the ship-to-shore movement. (See par. 2610b.)

d. Maintenance.--The LVTC7 should not be operated continuously longer than 72 hours during operations ashore. After this length of time, both communication and vehicle maintenance are required. Alternate systems during fluid situations, especially mechanized operations, must be planned for.

APPENDIX A

LVTP7 CHARACTERISTICS

The Assault Amphibious Personnel Carrier, LVTP7 is a full tracked, amphibious vehicle designed to provide armor-protected transportation for landing forces, their supporting equipment, and supplies. The vehicle can be operated from offshore shipping through rough seas and plunging surf, and it can, without modification, traverse beaches, cross rough terrain, and perform high speed operations on improved roads and highways. Hull arrangements provide maximum unobstructed space for troops and cargo. The engine compartment is located at the bow, and the personnel/cargo compartment with ramp access is located in the stern. Armament consists of the caliber .50 M85 weapon system which is mounted in a 360-degree electro-hydraulically powered turret.

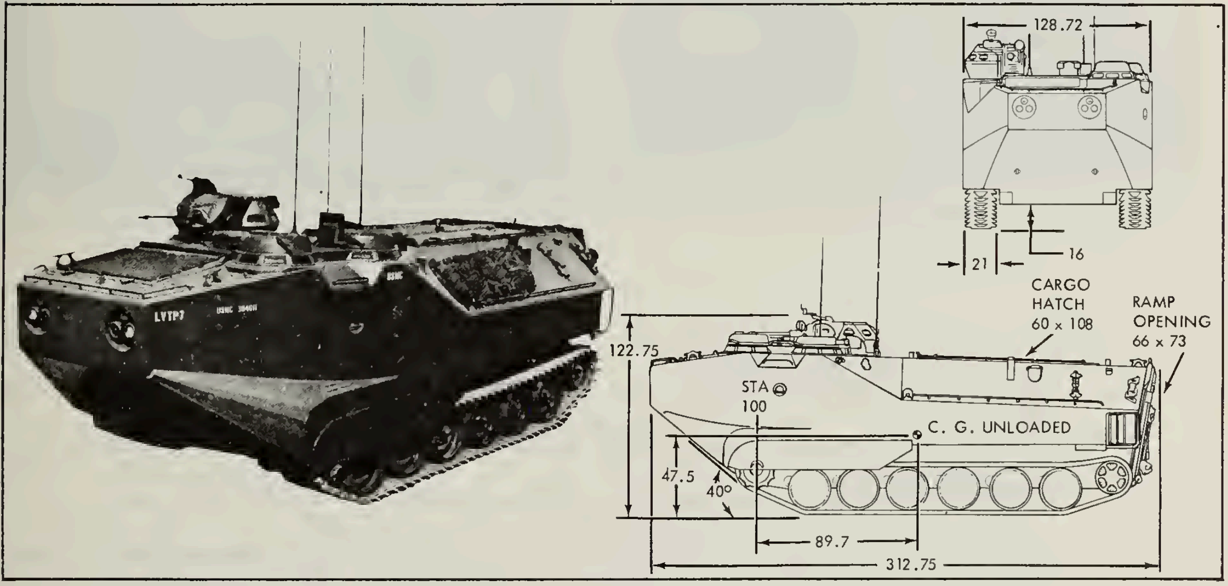
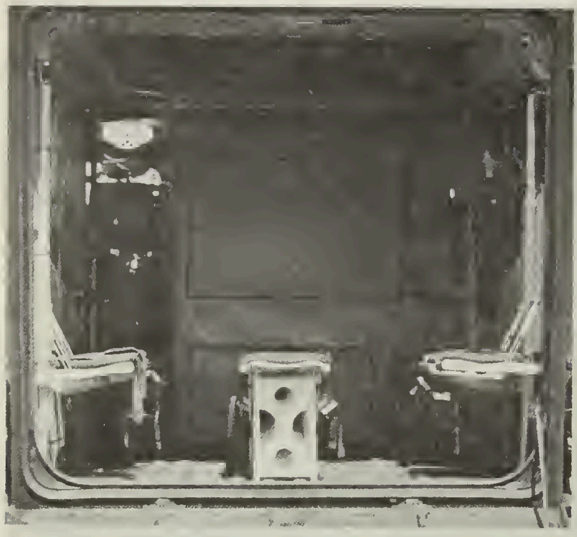
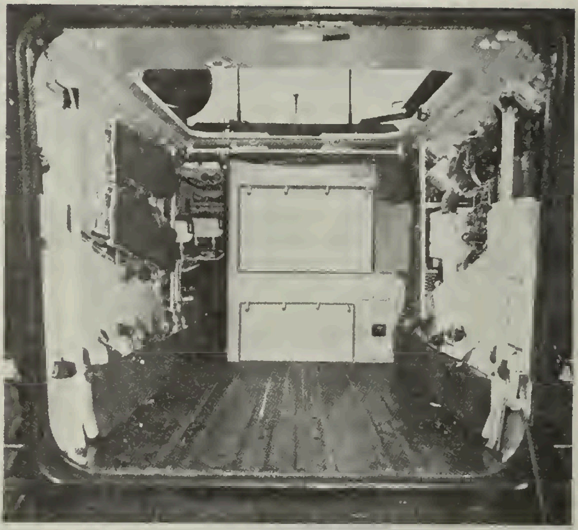


Figure 32.--Assault Amphibious Personnel Carrier, LVTP7.

(a) Crew	3
(b) Troops	25
(c) Armament Station:	
Armament	
Machinegun	Caliber .50 M85
Weight	65 pounds
Rate of fire (cyclic)	
High	1000 rds/min
Low	450 rds/min


TROOP SEATING


SEATS FOLDED FOR CARGO MISSIONS

Armament Station (continued):

Muzzle velocity	2840 fps
Range (max.)	6700m
Range (max. eff. range)	2195m
Ammunition	
Number of rounds (linked with M15A2 link' only	400
Traverse	360 degrees continuous
Elevation	+60 degrees
Depression	-15 degrees

(d) Weight:

Combat loaded	50,350 pounds
Unloaded (less crew and fuel)	38,451 pounds

(e) Center of gravity:

Unloaded:	
Above ground	47.5 inches
From Station 100	89.7 inches
Loaded:	
Above ground	48.1 inches
From Station 100	101.7 inches

(f)	Maximum draft (combat loaded)	67.8 inches
	Freeboard to driver's hatch coaming at above load	33.0 inches
	Freeboard to top deck at radiator air intake grille	39.9 inches
(g)	Unit ground pressure (loaded, zero penetration)	7.7 psi
(h)	Fuel capacity	180 gallons
(i)	Horsepower:	
	Gross to weight ratio	15.3 HP/ton
	Net to weight ratio	10.2 HP/ton
(j)	Drawbar pull (maximum at stall)	40,800 pounds
(k)	Cruising range:	
	Land @ 25 mph	300 miles
	Water @ 2,600 rpm	7 hours
(l)	Cruising speed:	
	Land	20-30 miles per hour
	Water	8 miles per hour
(m)	Maximum speed forward:	
	Land	40 miles per hour
	Water	8.4 miles per hour
(n)	Maximum speed reverse:	
	Land	12 miles per hour
	Water	4.5 miles per hour
(o)	Obstacle ability:	
	Trench span	8 feet
	Vertical	3 feet
(p)	Grade ascending ability, combat loaded:	
	Maximum forward grade	60 percent
	Maximum side slope	60 percent
(q)	Minimum turning radius:	
	Land	Pivot
	Water	Pivot
(r)	Engine:	
	Make and model	Detroit Diesel 8V53T
	Type	8 cylinder, 66 degree Vee, water-cooled, turbo-charged
	Bore	3.875 inches
	Stroke	4.50 inches
	Compression ratio	17:1
	Fuel	Multifuel
	Rated HP	400 ± 5 percent @ 2,800 rpm w/DF_2

Engine (continued)	
Rated torque	825 pound-feet ± 5 percent @ 2,150 rpm
Oil capacity	23 quarts
(s) Power train:	
Transmission	NAVSHIPS HS-400-3/FMC Corp.
Type	Hydraulic torque converter, parallel shaft gear arrangement
Maximum converter torque multiplication	2.83:1
Gear rations, forward:	
First speed	8.27:1
Second speed	4.63:1
Third speed	2.51:1
Fourth speed	1.41:1
Reverse	Uses first and second speed ratios
Final drive ratio	3.06:1
Overall maximum torque ratio (engine to sprocket)	70.8:1
Transmission oil capacity	23 gallons (w/oil coolers, filters, lines)

(t) Communications:
(See app. O)

APPENDIX B

LVTC7 CHARACTERISTICS

The Assault Amphibious Command Control, LVTC7 is employed as a mobile command post for communications with subordinate, adjacent, and senior infantry units as well as with supporting arms and logistic support units. It has work stations for 10 persons; communication equipment is located on the port side and staff equipment on the starboard side. With the exception of the modification of the cargo compartment, the vehicle is the same as the LVTP7. Included is an auxiliary power unit which furnishes electrical power to operate lights, fans, and communication equipment. Armament consists of the 7.62mm, M60 machinegun mounted on a free moving pintle directly forward of the starboard troop commander's hatch. Many characteristics of the LVTC7 are identical to those of the LVTP7. The characteristics that differ from those of the LVTP7 are addressed below.

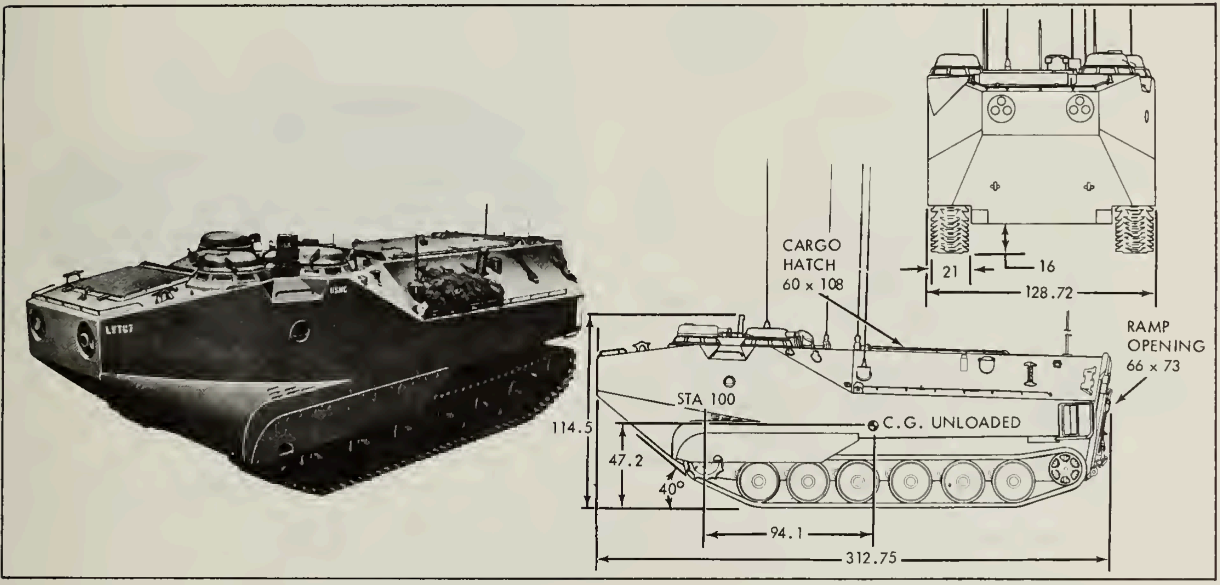


Figure 34.--Assault Amphibious Command Control, LVTC7.

(a) Staff and communications personnel	9
(b) Armament Station:	
Operation	Fixed
Armament	
Machinegun	7.62mm, M60D
Weight	23.16 pounds
Rate of fire	550 rds/min
Muzzle velocity	28 fps
Range (max.)	3200m

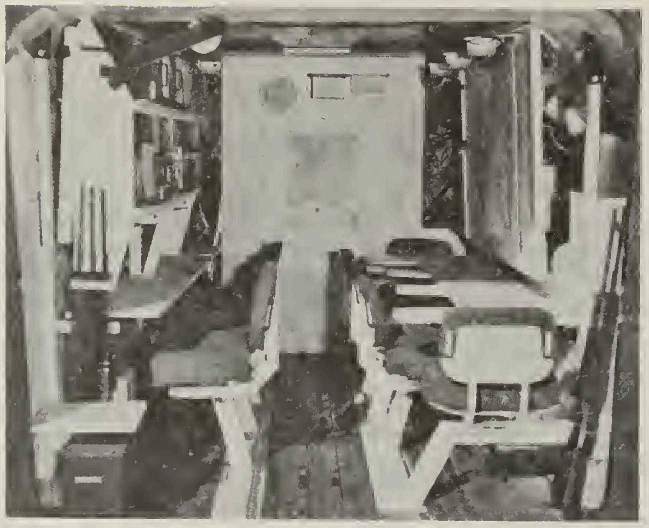


Figure 35.--LVTC7 Interior.

(c) Weight:

Combat loaded	44,111 pounds
Unloaded (less crew and fuel)	40,187 pounds

(d) Center of Gravity:

Unloaded:	
Above ground	47.2 inches
From Station 100	94.1 inches
Loaded:	
Above ground	48.3 inches
From Station 100	97.4 inches

(e) Maximum draft (combat loaded)	62.9 inches
Freeboard to driver's hatch coaming at above load	35.0 inches
Freeboard to top deck at radiator air intake grille	28.0 inches

(f) Unit ground pressure (loaded, zero penetration)	6.8 psi

(g) Horsepower:

Gross to weight ratio	17.3 HP/ton
Net to weight ratio	11.5 HP/ton

(h) Drawbar pull (maximum at stall)	36,123 pounds

(i) Communications:
(See app. O)

(j) Auxiliary Power Unit:

Weight (less fuel)	225 pounds
Voltage (DC)	24-28 volts
Maximum output at 3600 rpm	150 amps
Operating time each 150 amp	8 hours
Fuel capacity	6 gallons

APPENDIX C

LVTR7 CHARACTERISTICS

The Assault Amphibious Recovery, LVTR7 will enable vehicle recovery and maintenance functions to be performed in the field through the third echelon. Its principal equipment includes a hydraulic, telescoping, boom type crane with a 15,000-pound capacity, a 30,000-pound capacity recovery winch, as well as cutting, welding, and other portable maintenance equipment. Many characteristics of the LVTR7 are identical to those of the LVTP7. The characteristics that differ from those of the LVTP7 are addressed below.

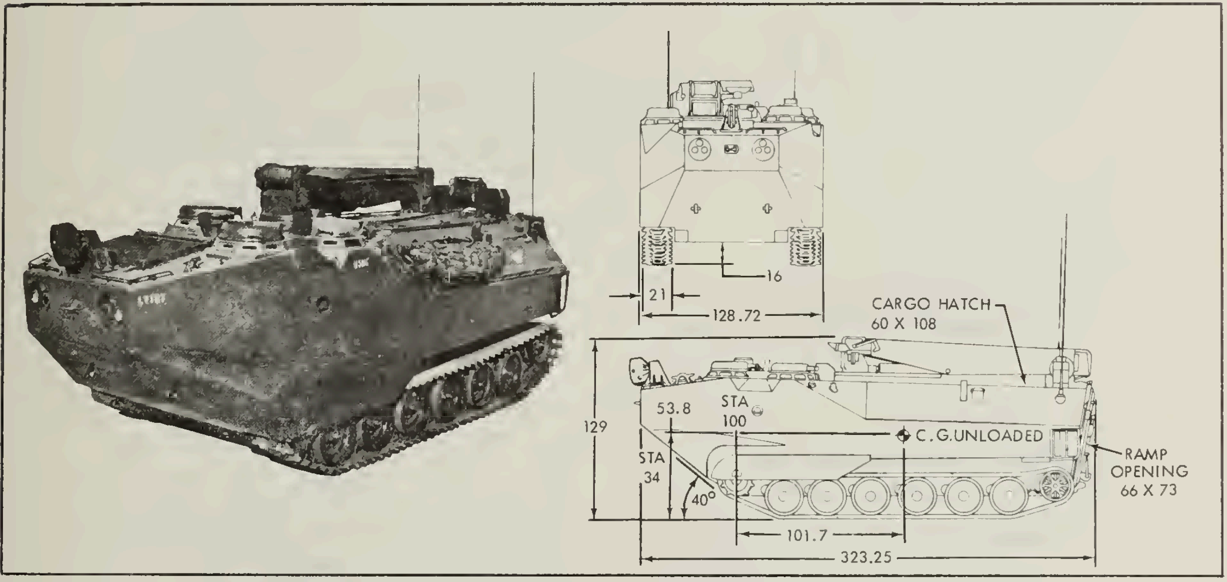


Figure 36.--Assault Amphibious Recovery, LVTR7.

(a) Crew	5
(b) Armament Station:	
Operation	Fixed
Armament	
Machinegun	7.62mm, M60D
Weight	23.16 pounds
Rate of fire	550 rds/min
Muzzle velocity	2800 fps
Range (max.)	3200m

(c) Weight:	
Combat loaded	49,853 pounds
Unloaded (less crew and fuel)	47,304 pounds
(d) Center of gravity:	
Unloaded:	
Above ground	53.8 inches
From Station 100	101.7 inches
Loaded:	
Above ground	54.6 inches
From Station 100	103.1 inches
(e) Maximum draft (combat loaded)	67.4 inches
Freeboard to driver's hatch coaming at above load	36.2 inches
Freeboard to inlet of air aspirator valve	43.0 inches
(f) Unit ground pressure (loaded, zero penetration)	7.9 psi
(g) Horsepower:	
Gross to weight ratio	15.0 HP/ton
Net to weight ratio	10.0 HP/ton
(h) Drawbar pull (maximum at stall)	40,440 pounds
(i) Communications: (See app. O)	
(j) Recovery equipment:	
Electrical power source:	
Alternator (engine driven):	
Rating	12.5 KVA, 0.8 PF, 60 cycle
Output	120 and 222 volts
Speed	3,600 rpm
Hydraulic power source:	
Pump (engine driven):	
Speed	575-2,700 rpm
Pressure	2,200 psi
Delivery rate @ 1,800 engine rpm and 1,700 rpm:	
Section 1	40 gpm
Sections 2 and 3	26.75 gpm
Section 4	6.5 gpm
A.C. generator rating	3,000 watt, 110 volts, 26 amps, 60 cycle
Air compressor, two-stage reciprocating:	
Pistol displacement	14.4 cfm
Operating pressure	145-175 psi (gauge)
Speed	720 rpm
Portable pump rating	3,200 rpm, 225 gpm @ 40-foot total head of water with 15-foot suction lift capable of pumping salt water or fuel

Recovery equipment (continued):	
Welder power supply range:	
MIG welding	14-35 volts, 250 amps
Metallic arc (stick) welding	40 volts, 75-200 amps
Portable oxygen-acetylene welding equipment:	
Battery charger:	
Output	24 volts DC, 35-40 amps
Charging time (200 AH battery)	8 hours

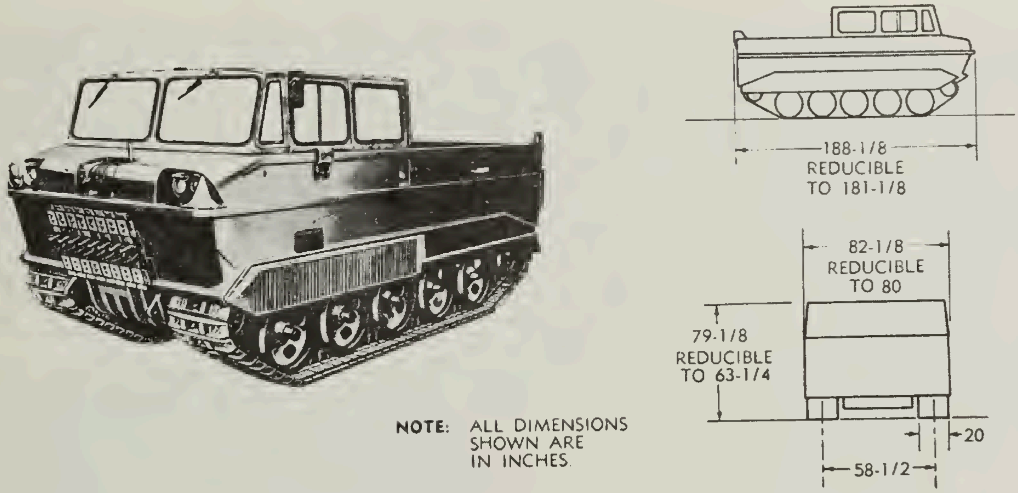
(k) Recovery equipment (continued)

Hydraulic crane:	
Horizontal reach maximum boom load capacity:	
Retracted, 13.5 feet	9,500 pounds
Extended to 15 feet	8,600 pounds
Extended to 18 feet	7,200 pounds
Fully extended to 21.5 feet	6,000 pounds
Working angle	0-65 degrees
Crane swing-moment capacity	14,000 feet/pounds
Crane moment rating	129,000 feet/pounds
Crane swing speed	1.5 rpm
Crane winch and recovery winch:	
Crane winch (single line rating)	6,000 pounds
Line speed:	
First layer	25.6 fpm
Second layer	31.2 fpm
Third layer	36.7 fpm
Wire rope:	
Diameter and classification	1/2 inch, 6x19 wire
Breaking strength	23,000 pounds
Length	85 feet
Recovery winch:	
Line pull:	
Low speed:	
Bare drum	30,000 pounds
Full drum	19,100 pounds
High speed:	
Bare drum	7,120 pounds
Full drum	4,360 pounds
Line speed:	
Low speed:	
Bare drum	25 fpm
Full drum	50 fpm
High speed:	
Bare drum	135 fpm
Full drum	220 fpm
Wire rope:	
Diameter and classification	3/4 inch, 6x37 wire
Breaking strength	48,600 pounds
Length	278 feet

APPENDIX D

M116 CHARACTERISTICS

The Carrier, Cargo, Amphibious, M116 is a marginal terrain, lightweight, low-silhouette vehicle designed to transport cargo or personnel. The vehicle is capable of operation with full-rated loads over unimproved roads, loose sand, muskeg, soft marshy terrain, and inland waterways. It has considerable mobility in the weak soils of delta areas due to its low ground pressure of 1.67 psi to 2.74 psi loaded, but it has limited mobility in traversing the dikes and steep river or canal banks. The M76 Xenon searchlight kit can also be used on this vehicle.



NOTE: ALL DIMENSIONS SHOWN ARE IN INCHES.

Figure 37.--Carrier, Cargo, Amphibious, 1 1/2 Ton, M116.

(a) Length	15 feet 6 inches
(b) Width	6 feet 10 inches
(c) Height	6 feet 8 inches
(d) Weight	7,400 pounds
(e) Capacity:	
Weight	3,000 pounds
Cargo	8 feet x 6 feet x 4 feet (estimate)
Personnel	11-14 including driver
(f) Speed:	
Improved roads	37 miles per hour
Cross-country	8-12 miles per hour
Water	3.7 miles per hour

(g) Armor protection .... None

(h) Armament .... None

(i) Range:
Land .... 300 miles
Water .... 22 miles

(j) Gradeability .... 60 percent

(k) Ground clearance .... 1 foot 3 1/2 inches to 1 foot 2 inches

APPENDIX E

M733 CHARACTERISTICS

This vehicle is basically an M116 (see app. D) cargo carrier to which steel armor plates are attached. Although the armor is capable of stopping caliber .30 ball ammunition, the vehicle is not configured for employment as a combat or assault vehicle. The purpose of the M733 is to provide small arms protection for infantry security elements who normally accompany the marginal terrain vehicles. The primary weapon is one M60D machinegun. Two additional pintle mounts are provided for the use of the M60/M60D machineguns. The vehicle is also capable of mounting the caliber .50 machinegun or the 81mm mortar.

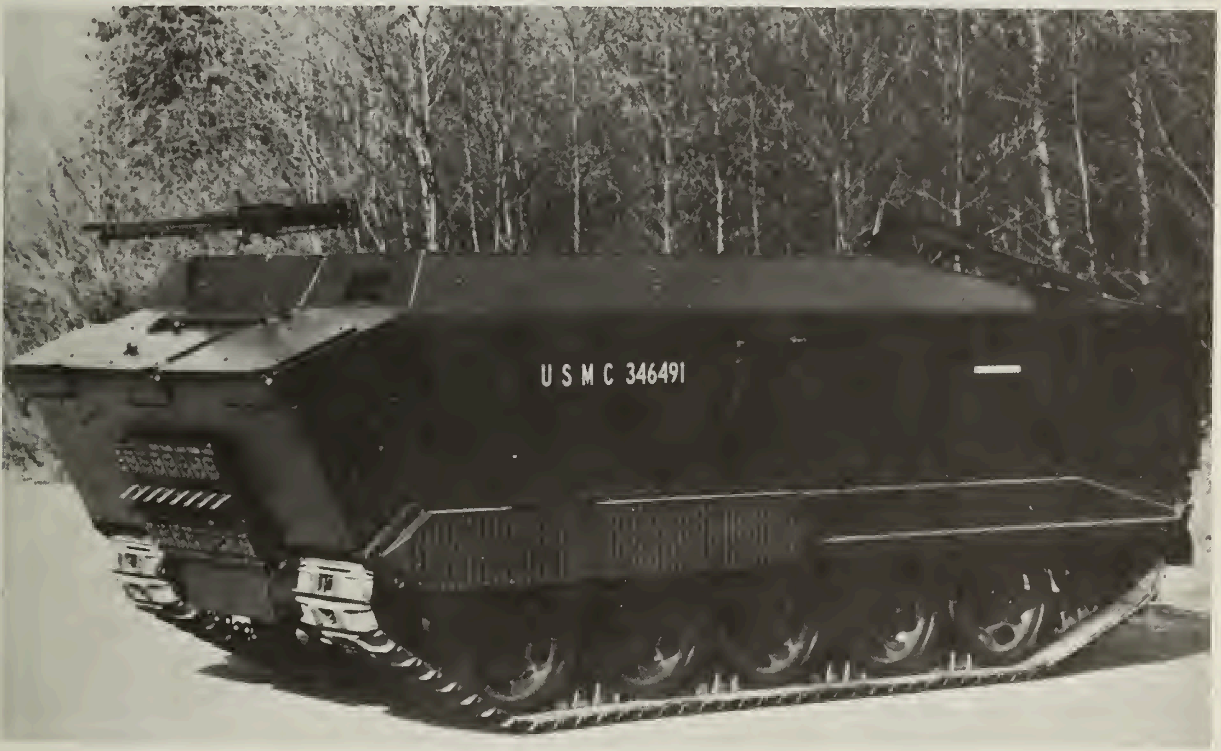


Figure 38.--Carrier, Cargo, Armor, Amphibious, 1 1/2 Ton, M733.

(a) Length	16 feet 5 inches
(b) Width	6 feet 10 inches
(c) Height	5 feet 7 inches
(d) Weight (less crew, stowage, and fuel)	8,760 pounds

(e) Capacity:	
With three MG's and seven men	11,400 pounds
With one MG, one caliber .50 ring mount, and seven men	11,750 pounds
With one MG, one 81mm mortar, and five men	12,500 pounds
(f) Speed:	
Improved roads	35 miles per hour
Cross-country	8-12 miles per hour
Water	4 miles per hour
(g) Armor protection	Steel
(h) Armament:	
M60/M60D machineguns	3
M60D machinegun and caliber .50 ring mount	1
M60D machinegun	1
81mm mortar	1
(i) Range:	
Land	220-260 miles
Water	22 miles
(j) Gradeability	60 percent
(k) Ground clearance	1 foot 3 1/2 inches to 1 foot 2 inches

APPENDIX F

LARC V CHARACTERISTICS

The LARC V is a lightweight, aluminum hulled, terratired amphibious vehicle having moderate water speed and good surfing ability. This vehicle is not suitable for swampy terrain and is not mobile in heavily irrigated terrain. It is suitable for transporting cargo from ship to shore, to beaches, or up fairly wide rivers and canals to semiprepared landing areas.

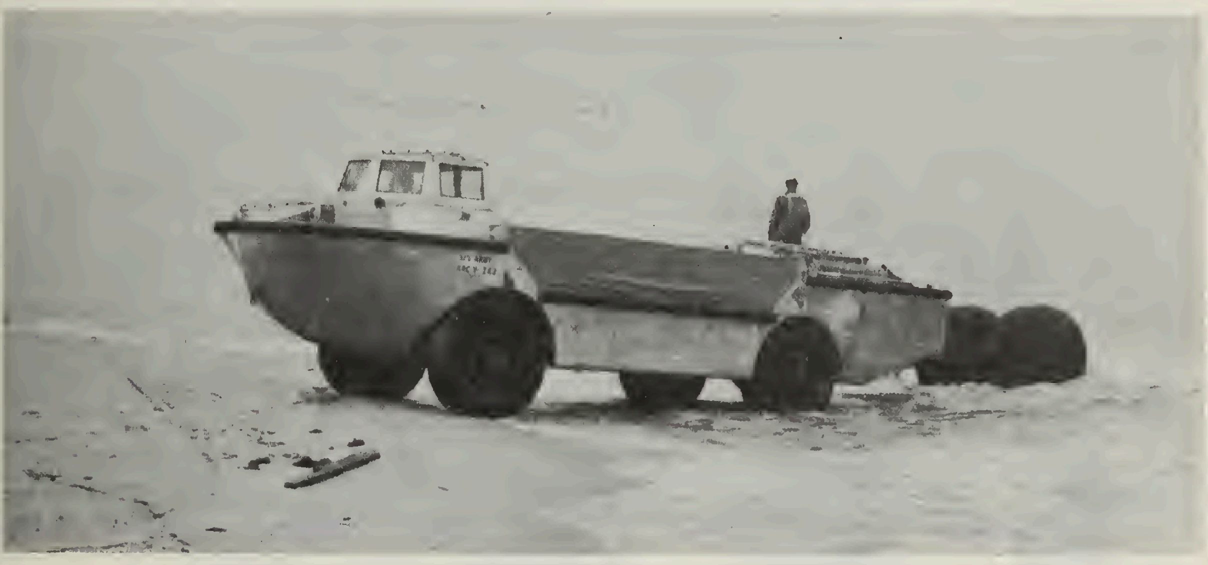
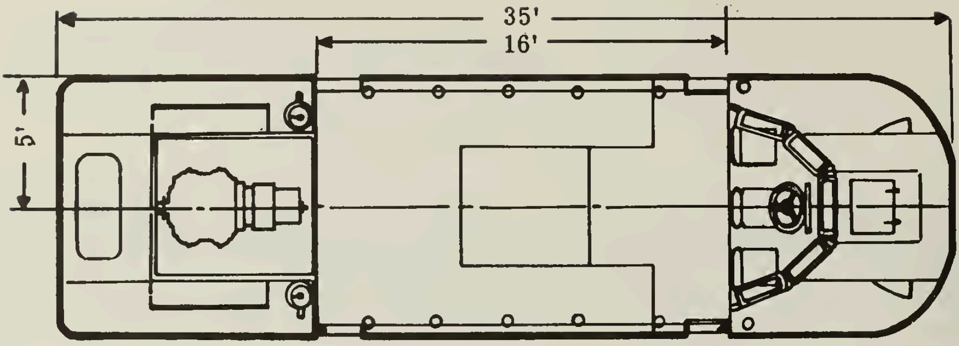
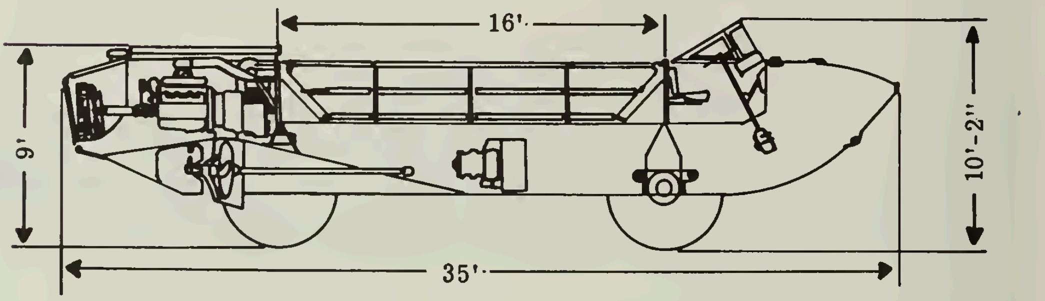


Figure 39.--Lighter, Amphibious, Resupply, Cargo, 5 Ton (LARC V).

(a) Length, overall	35 feet
(b) Width, overall	10 feet
(c) Speed, loaded:	
Land	30 miles per hour
Water	8.7 knots
(d) Operating, range, loaded:	
Land	200 miles
Water	60 miles
(e) Fuel consumption (gallons per hour)	20
(f) Crew	2
(g) Passenger capacities:	
Normal	0
Emergency	20





(h) Cargo capacities:
Normal .... 4.5 light tons
Maximum .... 5 light tons

APPENDIX G

LARC XV CHARACTERISTICS

The LARC XV is a medium weight, aluminum hulled, terratired amphibious vehicle with propulsion in water provided by propellers. This vehicle has demonstrated good water handling characteristics and mobility on firm and semifirm soils. It would be suitable for supply and resupply operations from offshore ships to prepared landing areas along riverbanks.

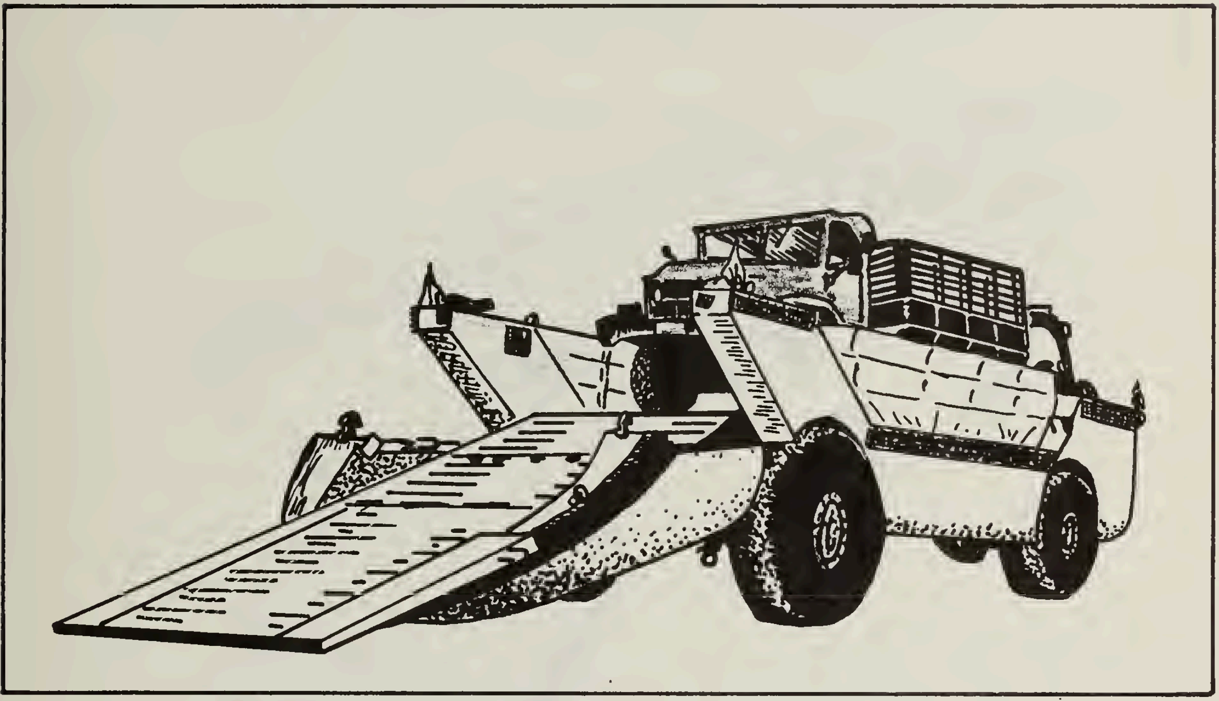
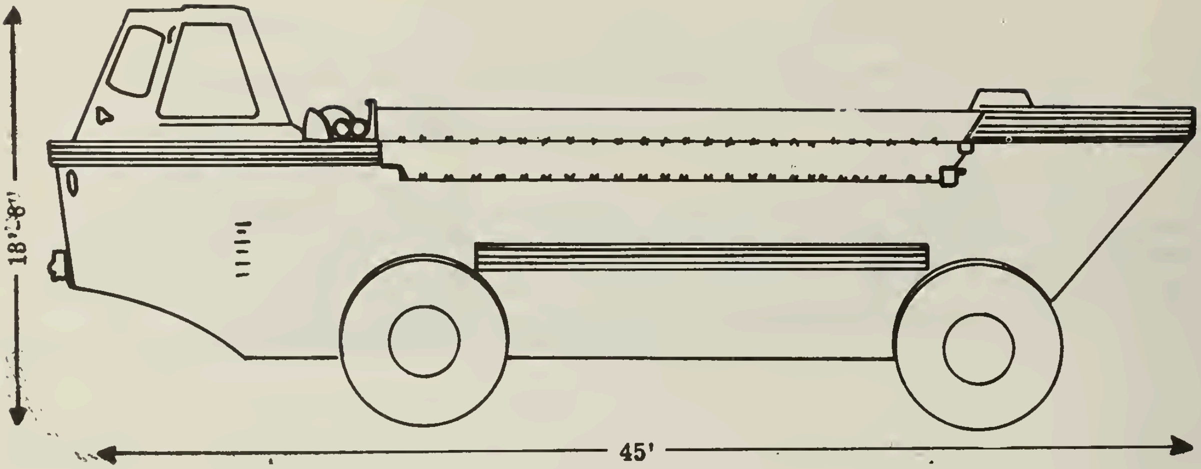


Figure 40.--Lighter, Amphibious, Resupply, Cargo, 15 Ton (LARC XV).

(a) Length	45 feet
(b) Width	14 feet
(c) Speed:	
Land:	
Improved roads	29.9 miles per hour
Cross-country	8-12 miles per hour
Water	8.4 knots
(d) Passenger capacity	56 including crew
(e) Cargo capacity	30,000 pounds
(f) Weight (w/crew and fuel)	45,200 pounds



(g) Fuel capacity .... 435 gallons

(h) Crew 2

APPENDIX H

LARC LX CHARACTERISTICS

The LARC LX (formerly designated Barge, Amphibious, Resupply, Cargo (BARC)) is a large, wheeled, unarmored cargo and personnel carrier. This vehicle is limited to transporting cargo or personnel from ships to landing areas or readily accessible inland points. The draft of 8 feet 8 inches requires a firm beach extending into the water for a considerable distance. Its maneuverability is limited by a turning radius of 75 feet.

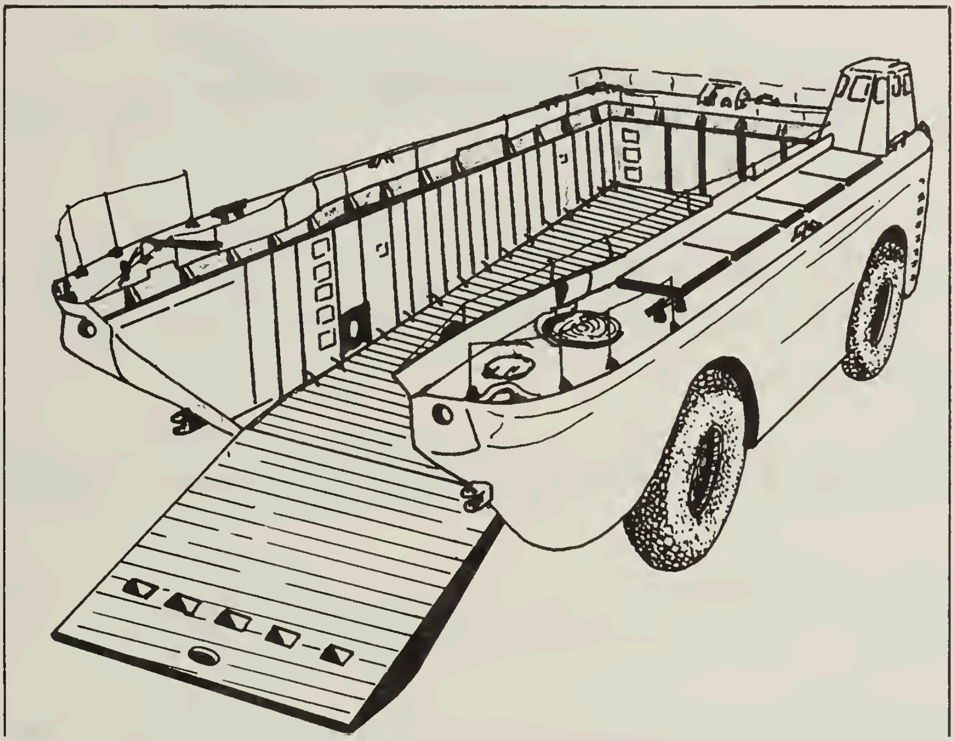
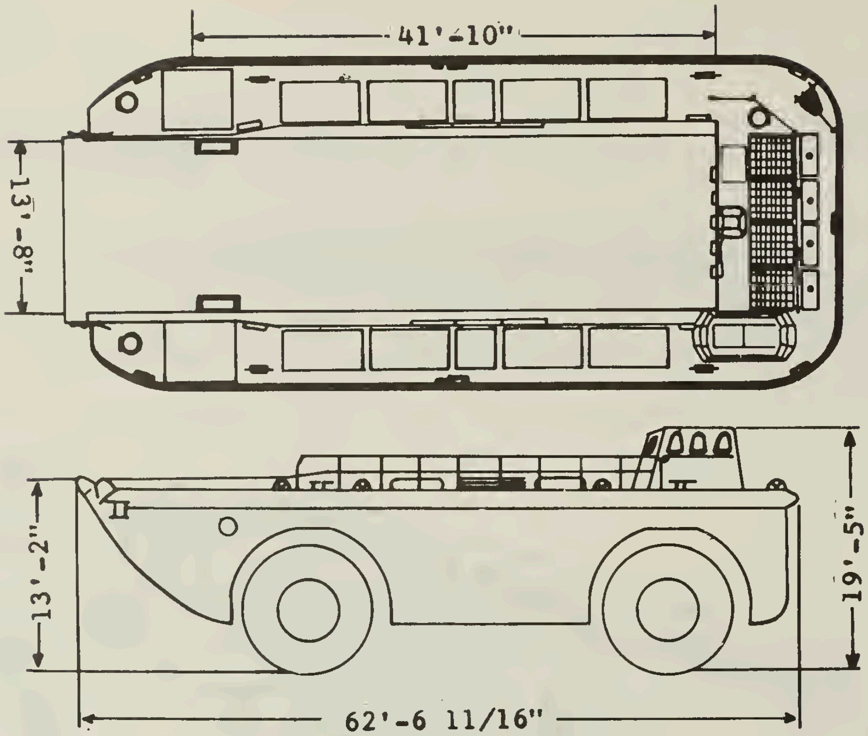


Figure 41.--Lighter, Amphibious, Resupply, Cargo, 60 Ton (LARC LX).

(a) Length, overall	62 feet 6 11/16 inches
(b) Width, overall	26 feet 7 inches
(c) Speed, loaded:	
Land:	
Improved roads	14 miles per hour
Cross-country	8-12 miles per hour
Water	6.14 knots



(d) Operating range, loaded:	
Land	150 miles
Water	75 miles
(e) Fuel consumption (gallons per hour)	40
(f) Crew	8
(g) Passenger capacities:	
Normal	125
Emergency	200
(h) Cargo capacity:	
Normal	60.0 light tons
Emergency	89.3 light tons

APPENDIX I

INFANTRY AND ARMORED FIGHTING VEHICLES (AFV) OPERATIONS

(NATO STANAG 2146)

OBJECT

1. The aim of the agreement is to standardize, for the use of the NATO Armed Forces the procedures to be adopted prior to infantry-armored fighting vehicle (AFV) operations.

AGREEMENT

2. Participating nations agree to adopt the procedures set forth in this agreement as standard practice prior to infantry-armored fighting vehicle (AFV) operations.

GENERAL

3. The infantry-AFV team must have a standard procedure for planning and launching operations. This procedure must be practiced and known to all to obtain the smooth and swift cooperation required in battle. The period of mutual preparation by AFV and infantry known as "marrying up" is especially important.

DEFINITION

4. Armored Fighting Vehicle (AFV) - is any armored combat vehicle, either wheeled or tracked, that mounts a direct fire support weapon.

STATEMENT OF DETAILS

5. Points to be observed. The major points to be considered in the planning of infantry-AFV operations are as follows:

a. Joint Planning

(1) Need for teamwork and the understanding of each other's tactical terminology, particularly when this is not common.

(2) Division of responsibility between infantry and AFV's.

(3) Joint reconnaissance and planning at all levels.

(4) Issue of orders, conjointly.

b. Liaison. Requirement for personal liaison before and during action.

c. Battle Drills

(1) Action in assembly area. Marry up and complete battle operation.

(2) Infantry-AFV target indication procedure.

(3) Establishing joint hide and harbor drills.

(4) Rehearsals.

d. Command and Control

(1) Appointment of a single commander.

(2) Establishing status of command of participating units and subunits.

(3) Radio.

e. Joint Training

(1) Vehicle recognition.

(2) Practice action in assembly area.

6. The amount of direction which can be given on any of the major points shown in paragraph 5 above depends on the tactical situation and the responsibility for this direction is best left to the commander in the field. The following gives an example of how cooperation can be achieved in a particular field.

7. Marrying Up. This includes the following:

a. Prior to Infantry-AFV Operations

(1) Infantry (including other supporting elements) and AFV crews must get to know each other. This is essential at the lowest levels.

(2) Each element of the infantry-AFV team must be aware of how they can assist the other in battle. This includes a knowledge of the characteristics of weapons, equipment, communications, and limitations of each arm.

(3) All planning for operations is carried out jointly by each of the elements participating in the operation.

(4) Simple battle drills relating to tactical deployment must be checked and practiced whenever time permits.

(5) Mounting and dismounting drills for infantry when carried on or in AFV must be checked.

b. Essential Checks. If the tactical situation permits, the following checks shall be completed:

(1) Final check of communications (unless prevented by electronic silence).

(2) Final check of reference points.

(3) Check of responsibilities; i.e., AFV to infantry and infantry to AFV.

(4) Check of all special signals to be used (hand, visual, etc.) and exchange of recognition information.

APPENDIX J

AMPHIBIOUS SHIP CARRYING CAPACITY FOR AMPHIBIOUS VEHICLES

Ships of the amphibious fleet have varying internal characteristics which affect their amphibious vehicle carrying capacity. The ship's characteristics pamphlet must be consulted in order to determine the ship's true carrying capacity. The amphibious vehicle carrying capacities of certain classes of ships listed below are approximations and should not, therefore, be used for planning data.

TYPE SHIP AND CLASS	LVT CAPACITY*
LSD:	
28 through 35 Class:	
Well deck	52
Half deck (mezzanine)	No capacity
Super deck	No capacity
36 Class:	
Well deck	52
Half deck (mezzanine)	15
Super deck	No capacity
LPD:	
1 through 3 Class:	
Well deck	24
Upper vehicle storage deck	16
4 Class:	
Well deck	24
Upper vehicle storage deck	24
LST:	
1171 through 1178 Class:**	
Tank deck	21
Main deck	No capacity
1179 Class:	
Tank deck	23
Main deck	No capacity
LHA:	
1 Class:***	
Aft well deck	24
Forward well deck	20
3D deck	35

* Figures represent maximum capacities.

** This is part of the Military Sealift Command.

*** Figures may vary upon subsequent acceptance of ths ship and availability of a ship's loading characteristic pamphlet.

APPENDIX K

PREWATER OPERATION CHECKLIST FOR THE LVT

1. Check condition of surf zone or banks for obstacles and support for vehicle.

2. Check all instruments, gages, warning lights, and fuel quantity.

3. Check the four hull and two ramp drain plugs for security.

4. Close and secure ramp and ramp door.

5. Ensure that all bilge pumps, both electric and hydraulic, are operational and outlets are clear.

6. Close heater exhaust outlets by turning handles counterclockwise.

7. Ensure top deck aspiration air inlet valve is open and free to function properly.

8. Turn on ventilation fan.

9. Turn on electric bilge pumps.

10. Inflate armament station azimuth bearing seal.

11. Visually check plenum cover position indicators to ensure covers are closed.

12. Ensure contact cooler is connected into engine cooling circuit.

13. Close and secure all top deck hatches. No amphibious vehicle will debark from a ship unless absolute watertight integrity of the vehicle is ensured. Plenum covers may be closed manually if the main engine is inoperative.

14. Ensure all personnel do not have seat belts fastened.

15. Ensure all cargo and stowage are secured.

16. Just prior to entering water, place mode selector in WATER/JETS position and gear selector in "1" position. Accelerate slowly into surf or down bank.

    NOTE: When entering the surf, head straight into the waves to prevent loss of directional control and buoyant stability.

17. Steer vehicle on a heading straight into the waves while proceeding through surf or rough water.

18. When clear of surf zone or shallows, place transmission gear selector in neutral if desired. Do not set parking brake.

NOTE: When the vehicle is empty or contains less than 2,500 pounds of cargo, the tracks should remain engaged in "1" position to maintain bow-up trim.

APPENDIX L

ARM-AND-HAND SIGNALS FOR CONTROL OF AMPHIBIOUS VEHICLES

Illustrated on the following pages are the arm-and-hand signals employed to control the movements, operations, and formations of amphibious vehicles. Signals for use at night as well as during daylight are depicted in most cases. The following signals are included:

Assemble or Pass Tow Line - Figure 42
Attention - Figure 43
Cease Firing - Figure 44
Close Up - Figure 45
I Do Not Understand - Figure 46
Column Right (Left) - Figure 47
Commence Firing - Figure 48
Decrease Speed - Figure 49
Disperse - Figure 50
Dismount - Figure 51
Echelon Right (Left) - Figure 52
Disregard Previous Command/As You Were - Figure 53
Form Column - Figure 54
Advance or Move Out - Figure 55
Halt/Stop/Stop Towing - Figure 56
Increase Speed - Figure 57
Line Formation - Figure 58
Man Overboard - Figure 59
Mount - Figure 60
Open Up, Extend - Figure 61
By the Right (Left) Flank - Figure 62
Start Engines or Prepare to Move - Figure 63
Stop Engines - Figure 64
"Vee" Formation - Figure 65
Wedge Formation - Figure 66
Breakdown - Figure 67
Commence Towing - Figure 68
Cast Off Tow Line - Figure 69
Air Attack - Figure 70
Nuclear Warning - Figure 71
Ramp Up and Dogged - Figure 72
Ramp Down - Figure 73

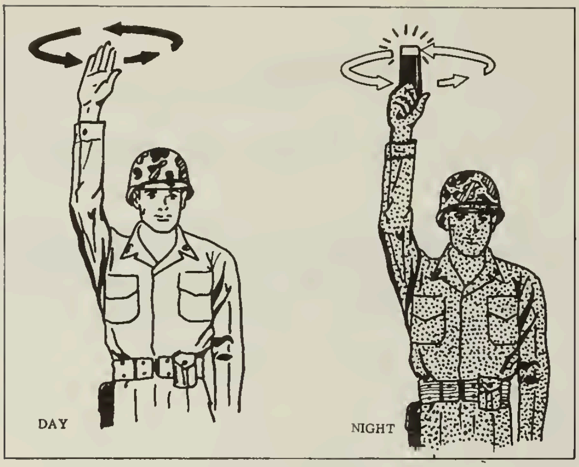


Figure 42.--Assemble or Pass Tow Line.

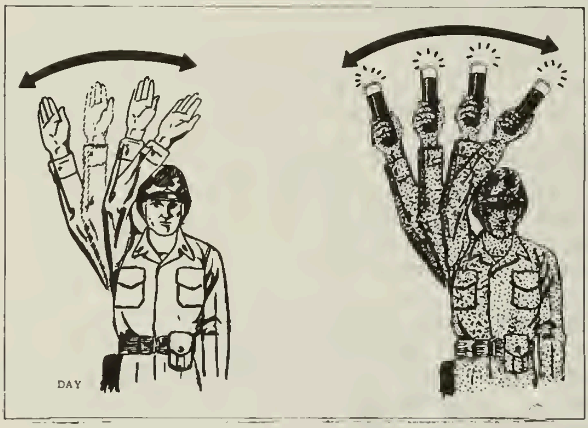


Figure 43.--Attention.

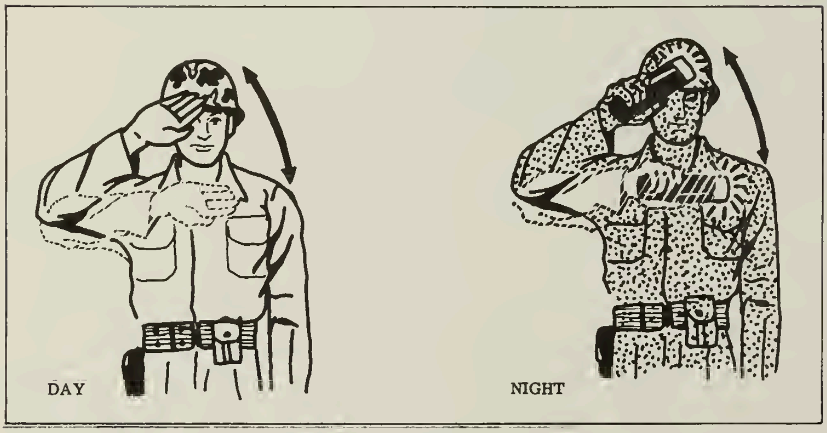


Figure 44.--Cease Firing.

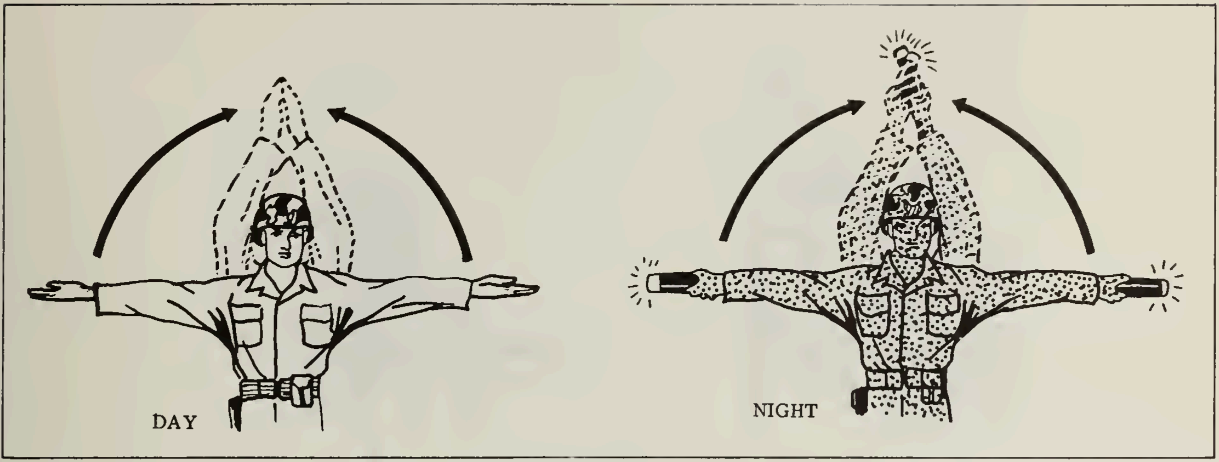


Figure 45.--Close Up.

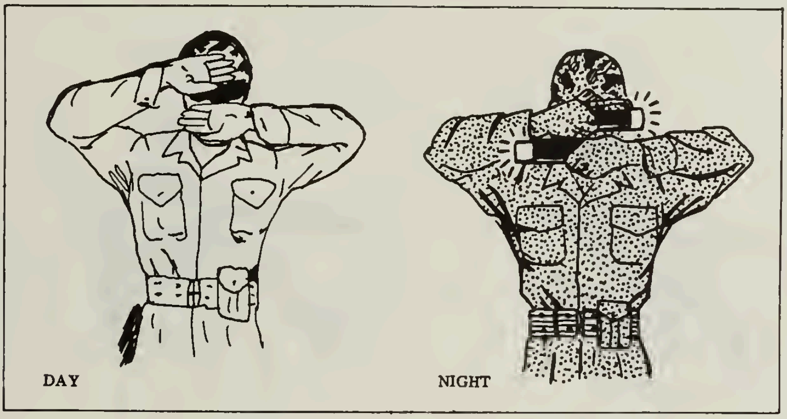


Figure 46.--I Do Not Understand.

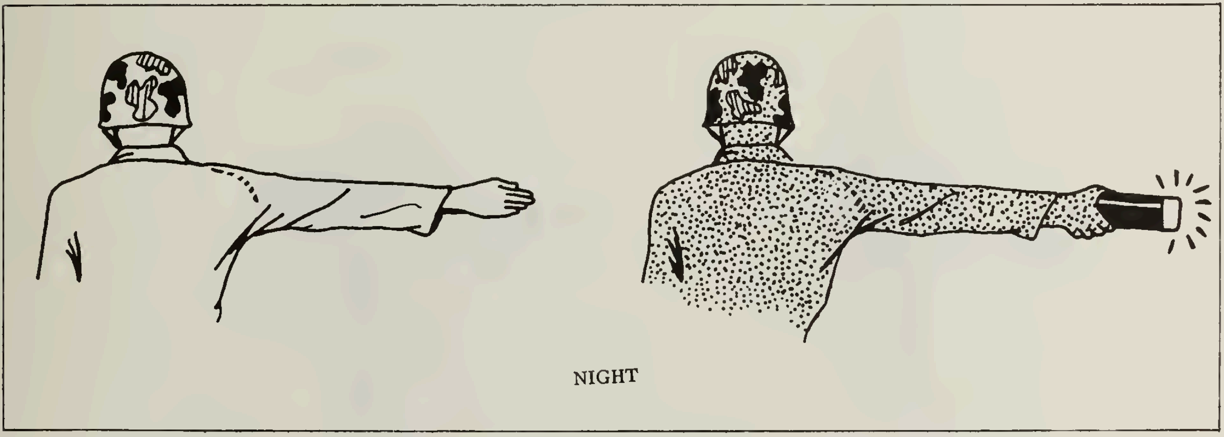


Figure 47.--Column Right (Left).

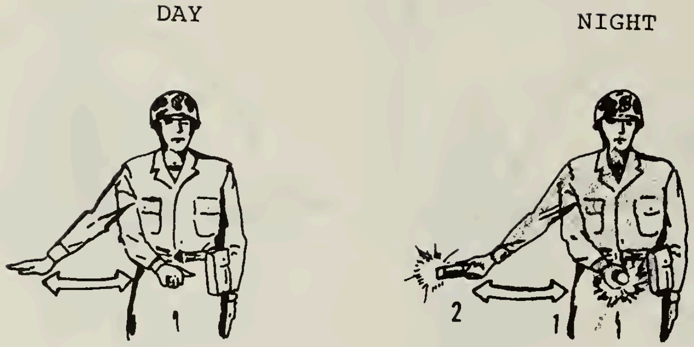


Figure 48.--Commence Firing.

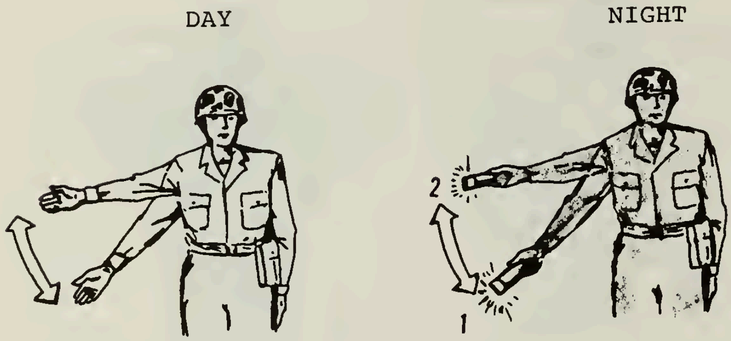


Figure 49.--Decrease Speed.

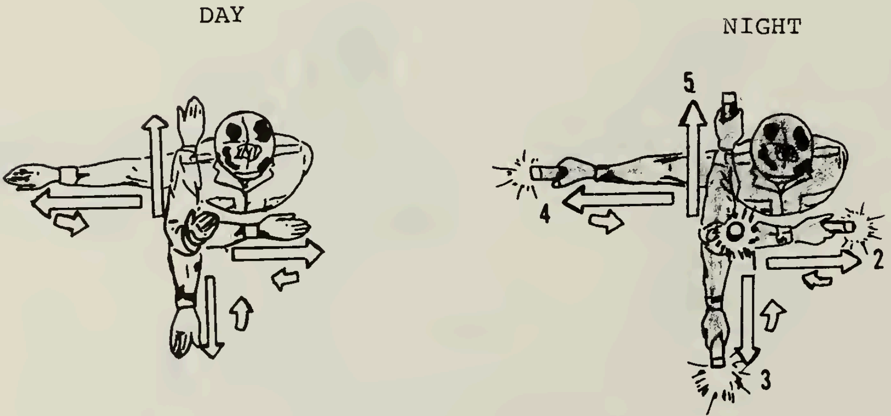


Figure 50.--Disperse.

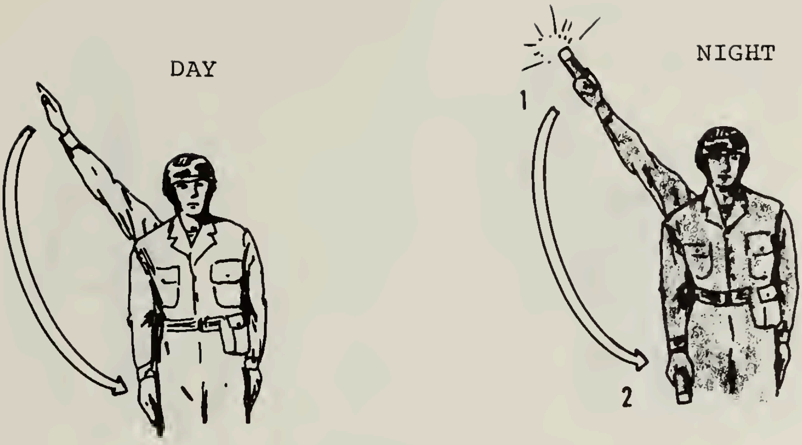


Figure 51.--Dismount.

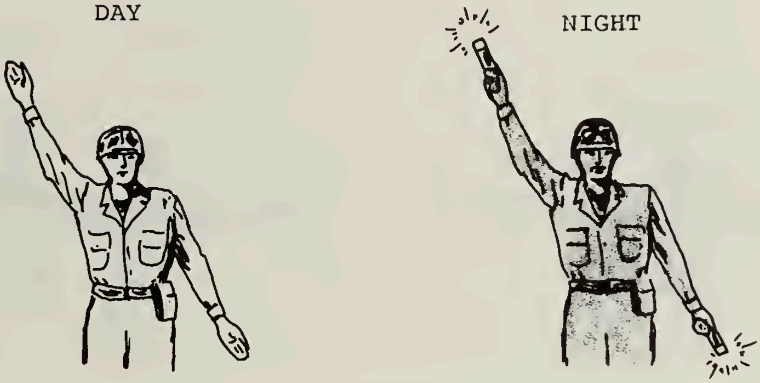


Figure 52.--Echelon Right (Left).

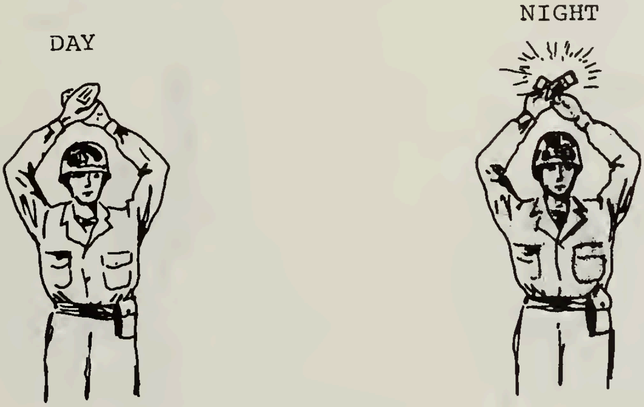


Figure 53.--Disregard Previous Command/As You Were.

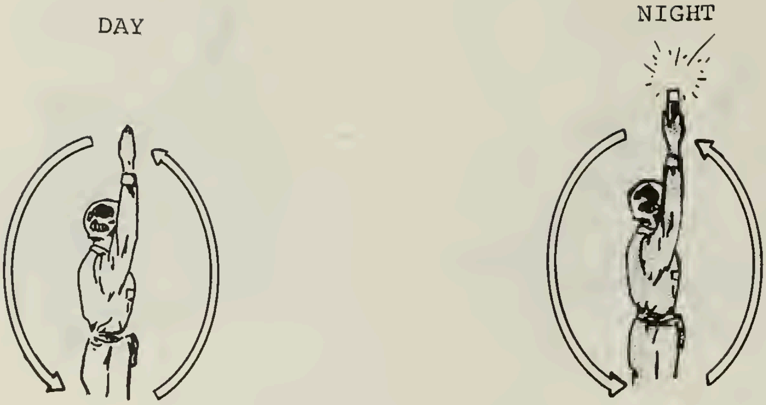


Figure 54.--Form Column.

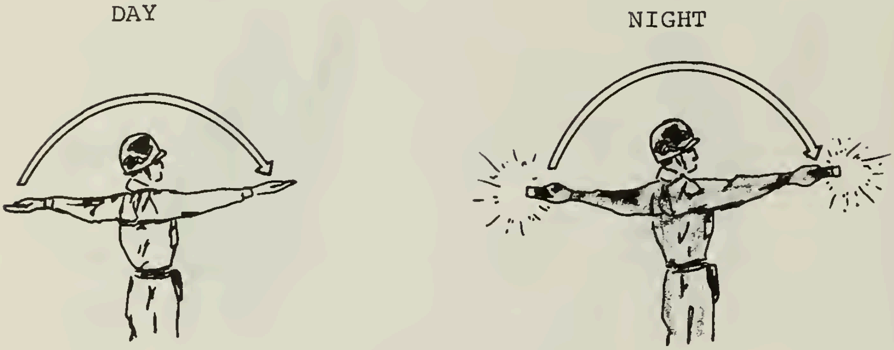


Figure 55.--Advance or Move Out.

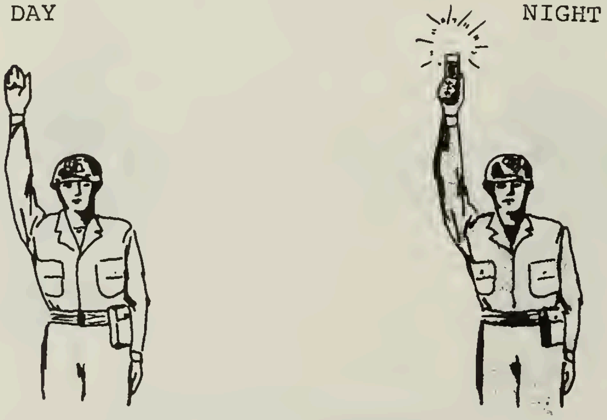


Figure 56.--Halt/Stop/Stop Towing.

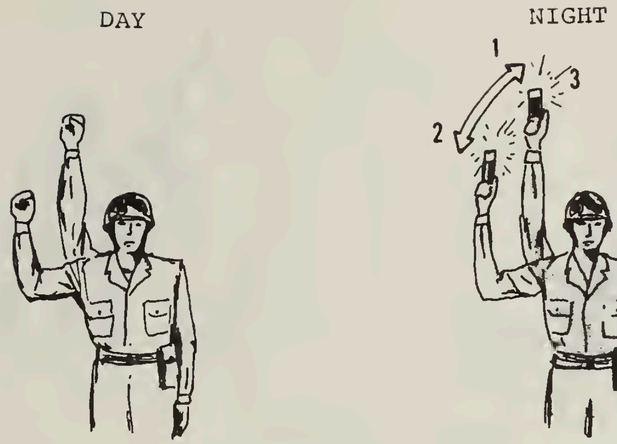


Figure 57.--Increase Speed.

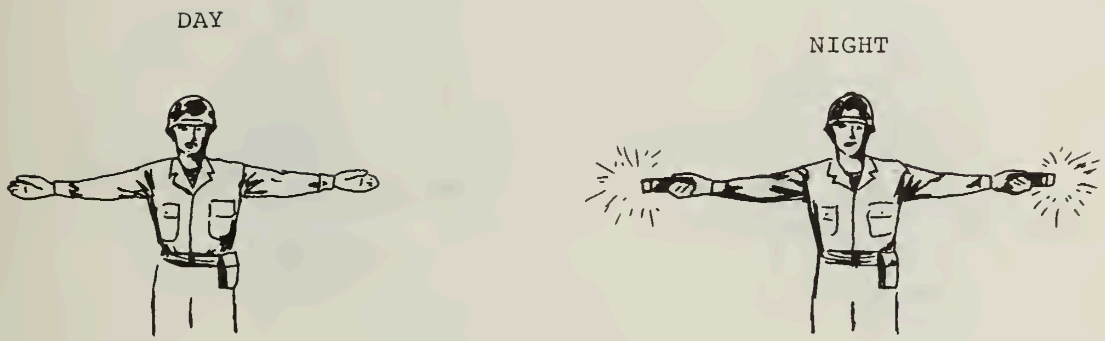


Figure 58.--Line Formation.

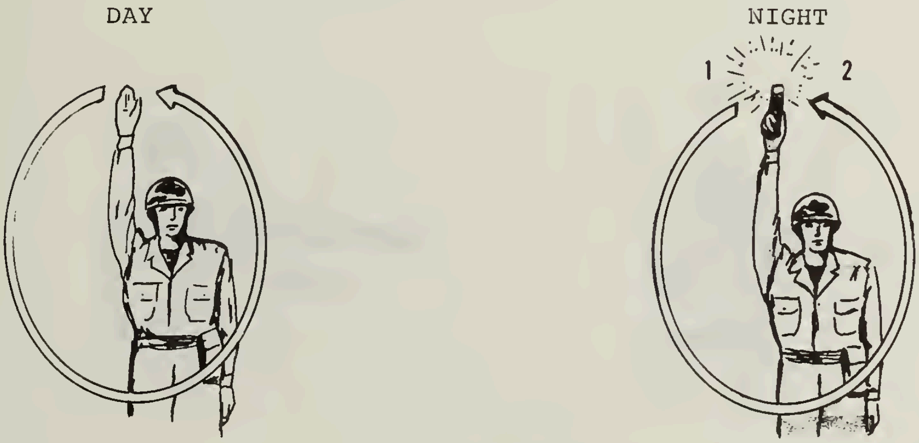
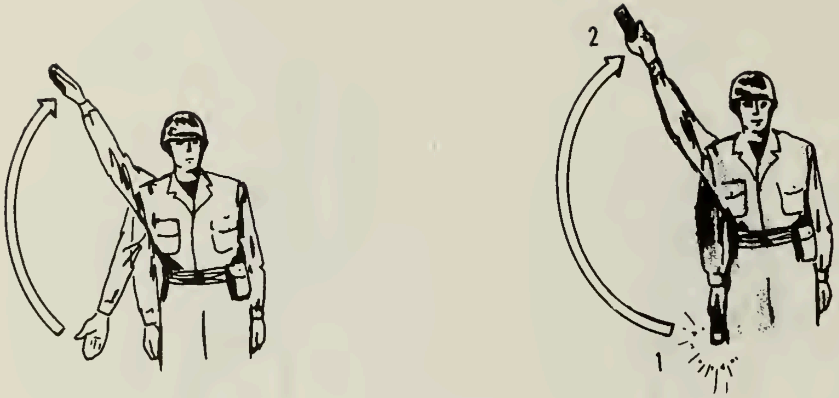
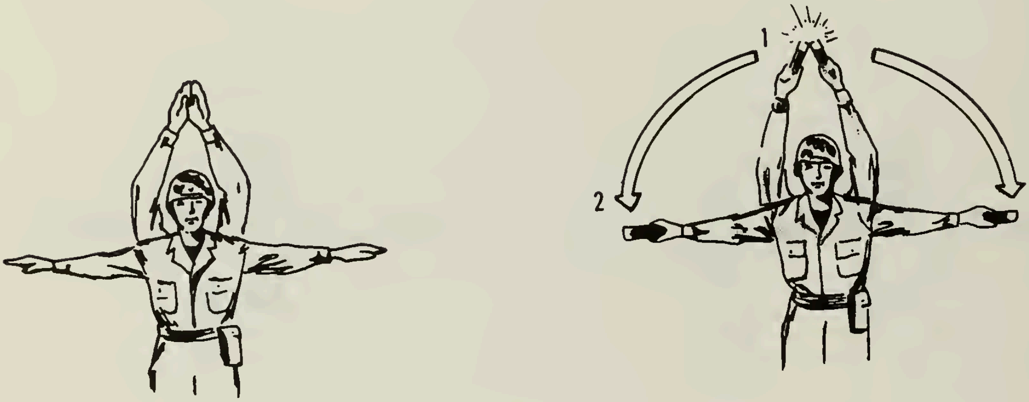


Figure 59.--Man Overboard.


DAY

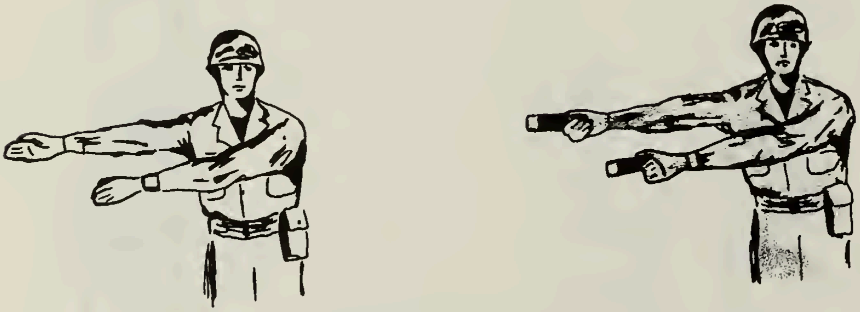
NIGHT

Figure 60.--Mount.


DAY

NIGHT

Figure 61.--Open Up, Extend.


DAY

NIGHT

Figure 62.--By the Right (Left) Flank.

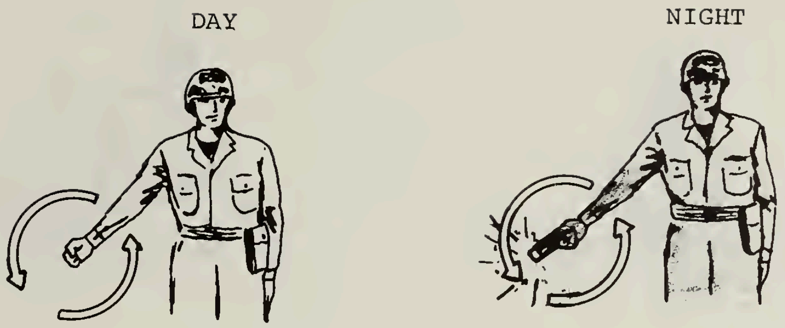


Figure 63.--Start Engines or Prepare to Move.

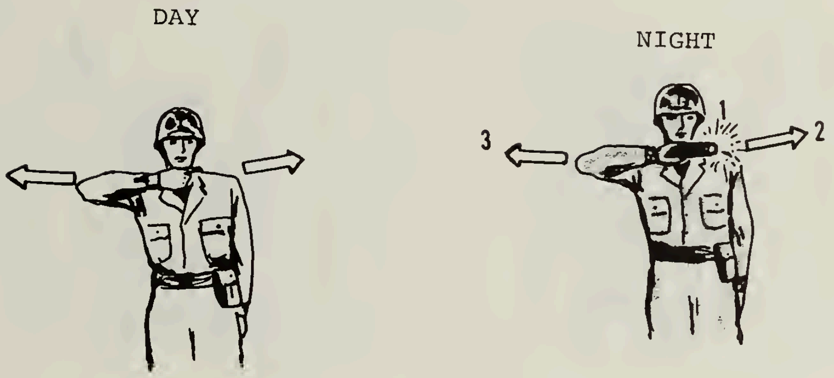


Figure 64.--Stop Engines.

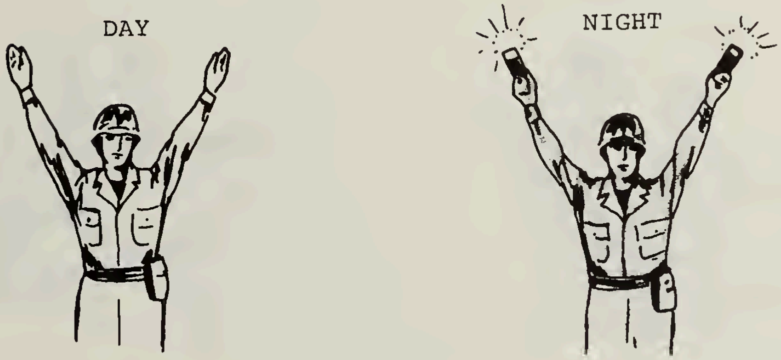


Figure 65.--"Vee" Formation.

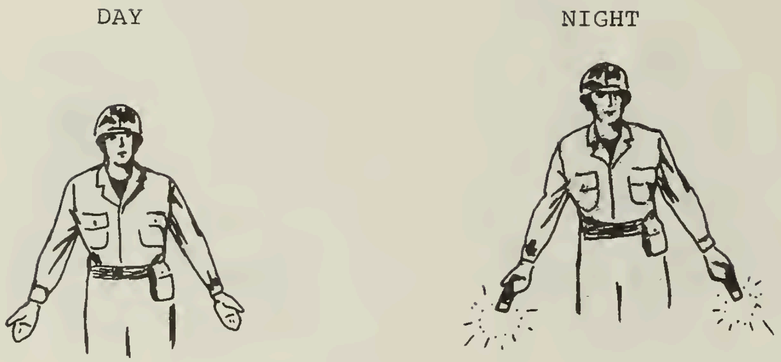


Figure 66.--Wedge Formation.

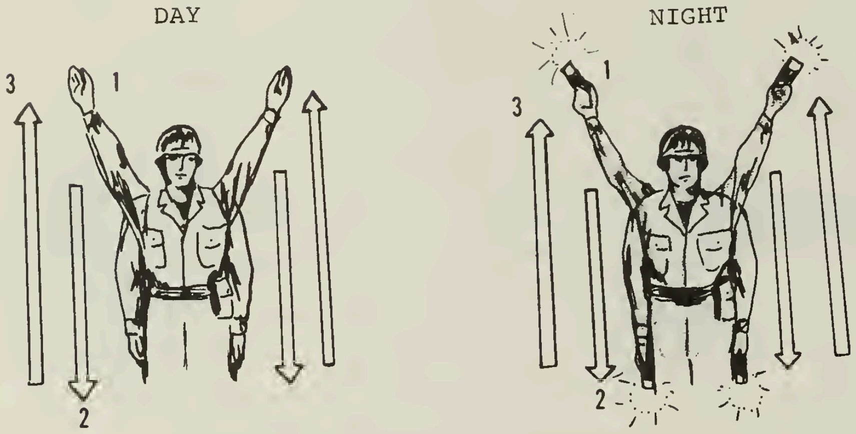


Figure 67.--Breakdown.

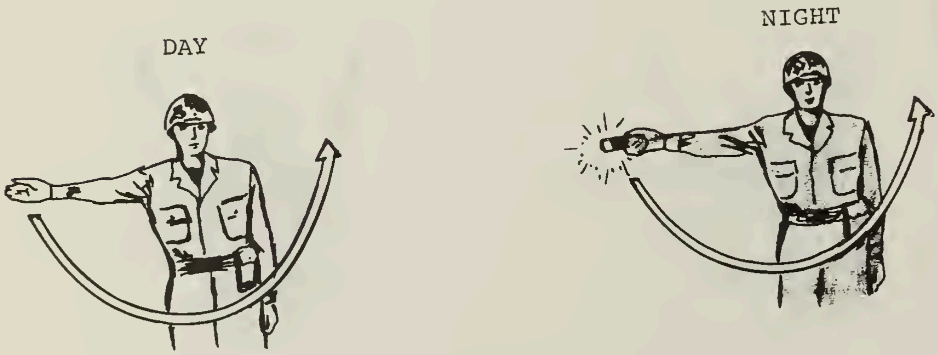
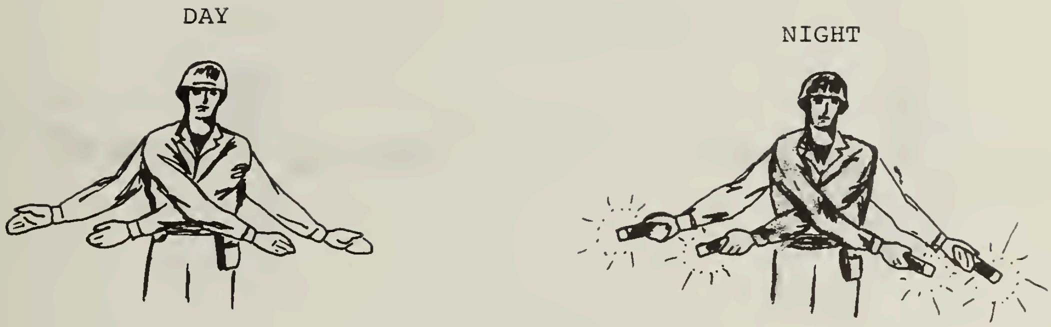


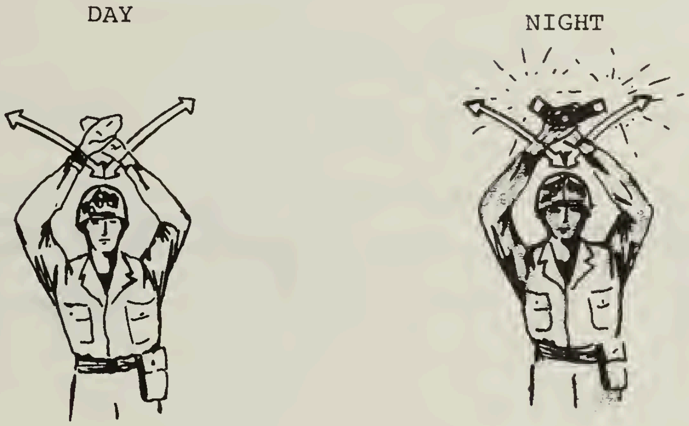
Figure 68.--Commence Towing.



DAY

NIGHT

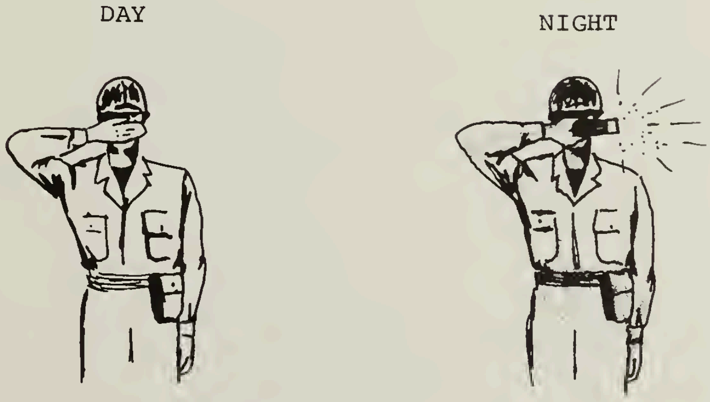
Figure 69.--Cast Off Tow Line.



DAY

NIGHT

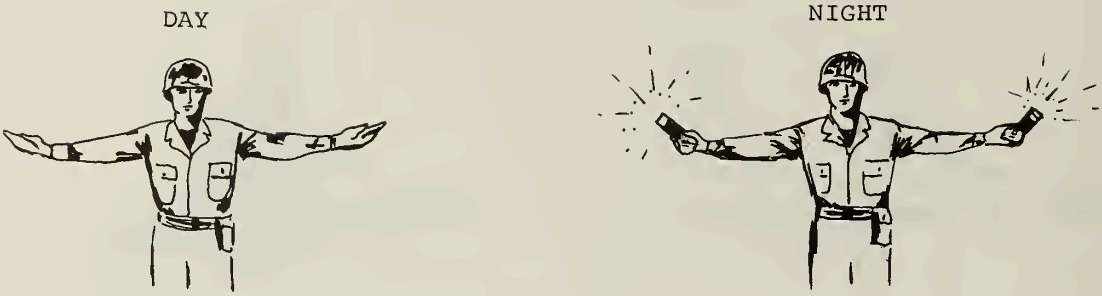
Figure 70.--Air Attack.



DAY

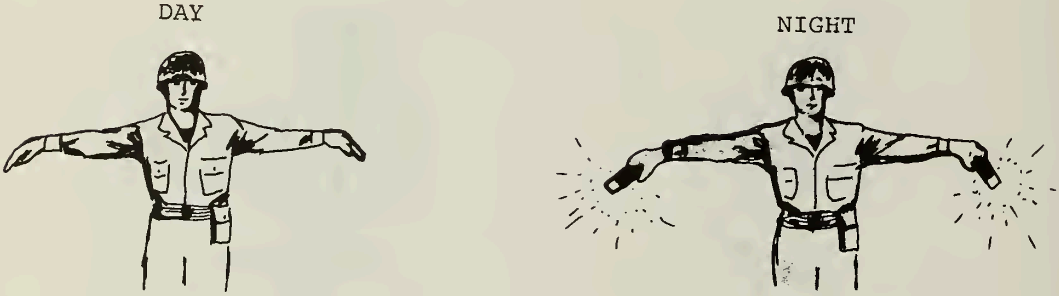
NIGHT

Figure 71.--Nuclear Warning.


DAY

NIGHT

Figure 72.--Ramp Up and Dogged.


DAY

NIGHT

Figure 73.--Ramp Down.

APPENDIX M

TYPICAL LVTP7 CARGO LOADS

1. Maximum Weight: 10,000 pounds.

2. The following items may be carried by the LVTP7:

    a. M151 jeep.

    b. M416 trailer.

    c. M274 light infantry weapons carrier with 106mm recoilless rifle or two empty M274's in the stacked position.

    d. MRC-109 radio jeep (antenna must be removed).

    e. Seventeen 55-gallon drums.

    f. Seventy-five cases of 90mm tank ammunition.

    g. Decontaminating apparatus, power driven, skid mounted, multipurpose, 500-gallon, M12A1.

    h. One hundred thirty-eight cases of M85 caliber .50 ammunition.

    i. Three hundred thirty unpalletized 5-gallon water cans.

    j. Four hundred cases of "C" rations.

APPENDIX N

LVT COLD WEATHER ENGINE STARTING PROCEDURES

When temperatures range from plus 32 degrees to minus 25 degrees Fahrenheit, the engine should be started by following the procedure listed below. When the temperature drops below minus 25 degrees Fahrenheit, a coolant heater should be installed.

1. Set parking brakes with transmission gear selector positioned in neutral.
2. Disengage hydrostatic steer unit by pulling control lever outboard, then aft.
3. Place mode selector switch in WATER/TRACKS position to turn off cooling fan and close plenum covers.
4. Disengage power takeoff by pulling control lever outboard, then forward.
5. Place fuel control in OFF position.
6. Engage starting motor and hold air box heater switch in ON position. Crank engine for 30 seconds.
7. Place fuel control lever in ON position and continue cranking engine. Operate air box heater switch in cycles of 1 second ON and 1 second OFF until engine speed reaches 400 to 500 rpm. Engine cranking speed must exceed 200 rpm to assure positive starting. (At least 2 1/2 minutes of starter and preheater operation is considered normal.)
8. Depress accelerator pedal approximately halfway and release starter switch. Slowly increase engine speed to 1,500 rpm.
9. Make certain parking brake has remained locked and place transmission gear selector in "4" position. Maintain an engine speed of 1,500 to 1,600 rpm until engine coolant temperature reaches 130 degrees to 150 degrees Fahrenheit.
10. Place transmission gear selector in neutral and stop engine.
11. Engage hydrostatic steer unit by pushing control lever forward.
12. Engage power takeoff by pushing control lever inboard, then aft. (It may be necessary to jog engine starter to engage power takeoff.)
13. Start engine in normal manner and slowly increase engine speed to 1,500 rpm.
14. Place transmission gear selector in "4" position. Maintain an engine speed of 1,500 to 1,800 rpm for 5 to 10 minutes or until engine coolant temperature reaches 160 degrees to 180 degrees Fahrenheit.
15. Place mode selector switch in LAND position to turn on cooling fan and open plenum covers.

16. Place transmission gear selector in "1" position, release parking brake, and proceed slowly in order to warm up final drives and suspension components.

APPENDIX O

COMMUNICATION EQUIPMENT INSTALLED IN LVT'S

1. GENERAL

This appendix lists the radio sets, by vehicle type, installed in amphibious vehicles.

2. LVTP7

Equipment: Two Radio-Receiver R-442/VRC, Receiver-Transmitter RT 246/VRC, Receiver-Transmitter RT 524/VRC, and Mounting Base MT-1029/VRC

Location: Personnel compartment, starboard side

Intercom Set: In radio, five stations

Frequency: 30-75.95 MHz (all components)

Emission: Voice (FM)

Range: 15-20 miles

Nets With: AN/PRC-25, AN/PRC-77, AN/GRC-125, AN/MRC-109, AN/MRC-110

3. LVTR7

Equipment: Two Radio-Receiver R-442/VRC, Receiver-Transmitter RT 246/VRC, Control C-2298/VRC, two Mounting Base MT-1898/VRC, Amplifier AM-1780/VRC, and Mounting Base MT-1029/VRC

Location: Crew compartment, starboard side

Intercom Set: In radio, four stations

Frequency: 30-75.95 MHz (all components)

Emission: Voice (FM)

Range: 15-20 miles

Nets With: AN/PRC-25, AN/PRC-77, AN/GRC-125, AN/MRC-109, AN/MRC-110

4. LVTC7

Equipment:

Port Side:	SB-22/PT	Telephone Switchboard (29-line capacity)	(2)
	RT-671/PRC-47	Receiver-Transmitter	(1)
	RT-841/PRC-77	Receiver-Transmitter	(2)
	RT-695A/PRC-41 (modified)	Receiver-Transmitter	(1)
	RT-246/VRC	Receiver-Transmitter	(2)
	R-442/VRC	Auxiliary Receiver	(2)
	TSEC/KY-38	Voice Security Set *	(7)

* The using (supported) unit must provide voice security equipment for use in the command/communication compartment.)

Starboard Side:	RT-246/VRC	Receiver-Transmitter	(1)
	R-442/VRC	Auxiliary Receiver	(2)
	AM-1780/VRC	Amplifier	(2)

Intercom Systems with Common Master Station:

Vehicle Intercom	4 stations
Staff Intercom	4 stations
Communication Intercom	5 stations

Location: Command/Communication Compartment

Frequency:	VHF-FM	30-75.95 MHz (all components)
	HF-USB	2-11.999 MHz
	UHF-AM	225-399.9 MHz

Emission: Voice

Range: 15-20 miles (VHF)
Line of sight (UHF)

Nets With:	VHF-FM	AN/PRC-25, AN/PRC-77, AN/GRC-125, AN/MRC-109, AN/MRC-110
	HF-USB	Any HF transceiver (USB)
	UHF-AM	Any UHF transceiver (100 KHz channel spacing)

APPENDIX P

CHECKLIST FOR DISABLED LVT AFLOAT

1. GENERAL

When an amphibious vehicle becomes disabled while waterborne, every precaution is taken to safeguard the passengers and to move the vehicle safely to the beach.

2. DUTIES OF THE CREW

Duties of the amphibious vehicle crew include:

a. Crew Chief

(1) Displays NOVEMBER flag (daylight) or beams searchlight or battle lantern vertically in air (night).

(2) Notifies senior LVT representative present.

(3) Informs troop commander of situation and steps being taken.

(4) Contacts beach rescue team, informing them of nature of trouble and assistance desired.

(5) Ensures that all hatches are closed to prevent taking on water.

(6) Uses all means at hand to effect repairs or rescue.

(7) Supervises transfer of personnel to safety boat or another vehicle if necessary.

b. Driver

(1) Keeps master switch on.

(2) Shifts transmission to neutral position.

(3) Checks fuel shutoff lever and valve.

(4) Advances hand throttle to 1,800 rpm so hydraulic bilge pumps will operate at maximum efficiency (engine operative).

(5) Attempts to restart (engine inoperative).

(6) If vehicle must be towed on land and land only, disengages the transmission hydrostatic steer control level and makes preparations for tow and/or transfer of personnel.

c. Crewman

(1) Helps maintain discipline in the troop compartment.

(2) Assists personnel topside for transfer if necessary.

(3) Assists as directed by the crew chief.

(4) Observes the interior of vehicle for possible water/oil leaks, smoke, fumes, and any other hazardous condition.

(5) The crewman should position himself at the aft personnel door to ensure the door is secure during all water operations.

APPENDIX Q

CHECKLIST FOR SINKING LVT

1. GENERAL

When an amphibious vehicle is sinking, immediate and resourceful action is required of all aboard. Attention to orders of the vehicle crew chief is imperative and mandatory.

2. DUTIES OF THE CREW

Duties of the amphibious vehicle crew when the vehicle is sinking include:

a. Crew Chief

(1) Notifies LVT OIC or NCOIC by radio or by other means, if possible.

(2) Gives the order to abandon the vehicle.

(3) Fires the distress signal (red-red star) in the air over the vehicle.

(4) Opens the cargo hatches with assistance of the crewman.

(5) Controls and expedites evacuation of personnel.

(6) Zeros installed voice cypher equipment and secures keying material to his person.

(7) Notifies the beach rescue team by radio, if possible.

(8) Orders the crew to abandon the vehicle.

(9) Waves the NOVEMBER flag.

(10) Leaves the vehicle when all other personnel have been evacuated.

b. Driver

(1) Turns on headlights.

(2) Lowers seat and leaves vehicle through driver's hatch when directed by the crew chief.

c. Crewman

(1) Assists crew chief in opening cargo hatches.

(2) Assists passengers topside.

(3) Notifies crew chief when all passengers have departed the troop compartment.

(4) Leaves the vehicle when directed by the crew chief.

APPENDIX R

RESCUE PROCEDURES FOR LVT

1. GENERAL

No fixed criteria can be established for the rescue of waterborne LVT's under all circumstances. The urgency of the situation aboard the vehicle, condition of the sea, number of passengers embarked, skill of the crew, and availability of rescue means are factors which influence each situation. Vehicles disabled in the surf zone fall under the cognizance of the LVT officer or NCO directing LVT operations. Actual rescue responsibilities are generally set forth in unit regulations and standing operating procedures.

2. TOWING THE LVT

If repair facilities exist ashore, towing an LVT ashore through the surf zone is the primary course of action, surf conditions permitting. If no such facilities exist or if the LVT cannot be towed ashore, it will be towed to a wet well ship/dry well ship in that order.

a. Preparing Disabled LVT for Towing.--The crew of a disabled LVT will prepare it for towing by running the engine, if operable, with the hand throttle set at 1,800 rpm's. All hatches will be closed. The transmission will be placed in the NEUTRAL position and WATER/TRACK mode.

b. Towing Procedures.--As a general rule, recovery towing of LVT's should be accomplished only by another LVT or LCM. The crew of the towing vehicle will position their crew hatches at 90 degrees, and the crew chief will look aft to watch the condition of the disabled vehicle. The assistant driver will observe the proceedings from the vision block in the ramp and will be ready to use the internal quick release lever as directed by the crew chief should the disabled vehicle begin to sink. In addition, one crewman aboard the towed vehicle will remain topside to observe the proceedings and will protect himself from possible backlash by reversing the weapon station and remaining behind the hatch cover latched upright in the 90-degree position. All hatches will be closed when entering the water or crossing through the surf zone. The following steps are followed in towing disabled LVT's in the water:

(1) The rescue vehicle is positioned in front of the vehicle to be towed.

(2) Two 40-foot nylon towing lines, 2½ inches in circumference, with an 18-inch eye at each end are passed and secured to the two after mooring bitts of the towing vehicle and the quick release mechanism.

(3) The free ends of the lines affixed to the mooring bitts of the towing vehicles are crossed and passed to the disabled vehicle. The line from the port mooring bitt of the towing vehicle is secured to the starboard mooring bitt of the disabled vehicle and vice versa. (See fig. 74.)

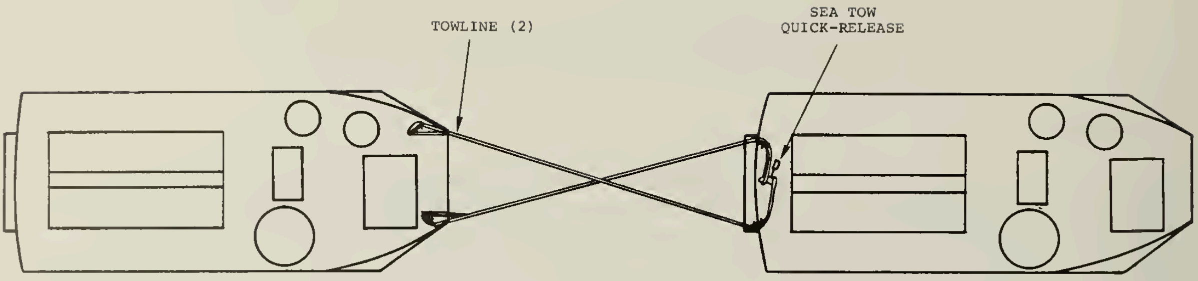


Figure 74.--Towing Hitches

(4) Once the two lines are connected, care must be taken to avoid possible backlash injury. The crew of the disabled vehicle will secure all hatches. The crew of the towing vehicle will either secure its hatches or position them at the 90-degree latch position.

(5) The LVT should be towed to the high water mark on the beach before the stern towing cable is attached. Attempting to attach the cable while the vehicles are partially in the surf zone can cause serious injury or death. If this method must be employed, care should be taken so as not to have any personnel trapped should towed vehicle shift.

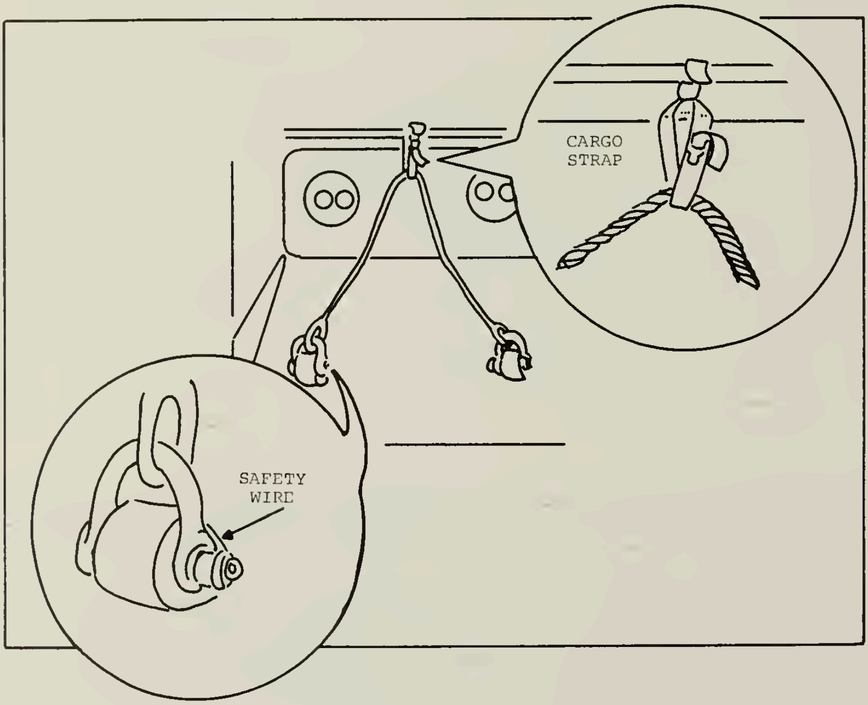


Figure 75.--Configuration of Towing Cable.

(6) LVT's involved in water operations will have their towing cable configured as shown in figure 75 to allow that LVT to be winched aboard a ship should the situation dictate.

(7) In any rescue/retrieval operation, the protection of the lives of personnel takes priority over the salvage of disabled vehicles.

3. PASSING THROUGH THE SURF ZONE

a. General Conditions.--Towing LVT's with crews embarked through the surf zone may be safely accomplished, provided the following conditions are met:

(1) Surf conditions are not hazardous. See paragraph 1808 for LVT surfing criteria.

(2) The tow lines used are at least 40 feet in length and proper towing procedures are used.

(3) The vehicle to be towed is prepared as outlined in paragraph 2a.

b. Passing Through Hazardous Surf.--Procedures to be employed when it is necessary to tow vehicles through the surf zone when hazardous surf conditions exist are established by appropriate unit directive.

APPENDIX S

DUTIES OF THE LVT CREW CHIEF, DRIVER, AND ASSISTANT DRIVER

1. GENERAL

The following paragraphs set forth recommended duties for LVT crew chiefs, drivers, and assistant drivers. This list of duties is offered as a guide. Modification of the duties of each of these personnel may be made at the unit level as required.

2. GENERAL DUTIES OF THE CREW CHIEF

The crew chief of an LVT is directly responsible for the following:

a. Conduct of the crew.

b. Supervision of all vehicular inspections and servicing operations in accordance with existing directives and instructions.

c. Reporting malfunctions of the vehicle to proper authority.

d. Safety of crew and embarked troops.

e. Operation of the LVT regardless of who is driving.

f. Turning in tools and special equipment to the designated agency when they are not in use, so that adequate storage and protection are provided.

3. SPECIAL DUTIES OF THE CREW CHIEF

a. Before Operation

(1) Inspect uniform and equipment of the crew. Ensure that all personnel wearing the inflatable life jacket have tested it for serviceability and have serviceable CO_2 cartridges inserted.

(2) Supervise vehicular checks and maintenance; take reports from the crew.

(3) Check operation of the radio and intercom. Ensure that proper radio procedure is used.

(4) Inspect cargo, ensuring that it is properly stowed.

(5) Enforce all safety precautions.

(6) Check all OEM and OVS gear to see that it is properly stowed and accounted for.

(7) Report the LVT's condition to a designated LVT officer or NCO.

b. During Operation

(1) Assist the driver by observing operation of the vehicle and giving appropriate instructions.

(2) Observe the trim of the LVT.

(3) Observe operation of the bilge pumps.

(4) Observe and carry out signals from section or platoon leader.

(5) Watch for and report floating debris, obstacles, and other vehicles or craft that may endanger his vehicle.

(6) Report LVT deficiencies to designated authority.

(7) Before water operation, complete the prewater operation checklist and deliver it to designated authority. Appendix K contains a recommended prewater operation checklist.

(8) Man the machinegun as required.

c. At the Halt

(1) Supervise maintenance by the crew.

(2) Check the overall condition of the vehicle.

(3) Check cargo ensuring that it is properly stowed.

d. After Operation

(1) Supervise maintenance by the crew.

(2) Dismount, clean, and stow machineguns.

(3) Enforce all safety precautions.

(4) Record fuel and oil consumption, maintenance accomplished, vehicular malfunctions, and operational hours in the tracked vehicle daily log of the tracked vehicle book.

4. GENERAL DUTIES OF THE DRIVER

The driver performs such general duties as directed by the crew chief or other authority.

5. SPECIFIC DUTIES OF THE DRIVER

The driver of an LVT has the following specific duties:

a. Before Operation

(1) Stand inspection.

(2) Check fuel, oil, and coolant levels.

(3) Inspect the engine compartment for fuel and oil leaks.

(4) Inspect all visible hydraulic lines.

(5) Inspect control linkage.

(6) Start the engine using correct procedure.

(7) Check instruments and accessories for proper functioning.

(8) Check the operating controls, engine operation, and transmission operation.

(9) Sound the horn prior to raising or lowering the ramp.

(10) Report deficiencies to the crew chief.

b. During Operation

(1) Observe proper driving procedure.

(2) Observe and report floating debris, obstacles, or other obstructions.

(3) Observe gauges, instruments, and warning lights for proper functioning and report any malfunction of the vehicle to the crew chief.

c. At the Halt

(1) Check for fuel, oil, and coolant leaks.

(2) Inspect the engine compartment for fuel and oil leaks.

(3) Check operating controls.

(4) Sound the horn prior to raising or lowering the ramp.

(5) Report deficiencies to the crew chief.

d. After Operation

(1) Observe proper engine stop procedure.

(2) Check instruments and operating controls.

(3) Check fuel, oil, and coolant levels.

(4) Inspect the engine compartment for fuel and oil leaks.

(5) Report oil and fuel consumption to the crew chief and add either as necessary to bring it to the proper level.

(6) Change engine air cleaners, if necessary.

(7) Check batteries and electrical connections.

(8) Assist in refueling, as necessary.

(9) Sound the horn prior to raising or lowering the ramp.

(10) Report deficiencies to the crew chief.

6. GENERAL DUTIES OF THE ASSISTANT DRIVER

The assistant driver performs such general duties as directed by the crew chief or other authority.

7. SPECIFIC DUTIES OF THE ASSISTANT DRIVER

The assistant driver of an LVT has the following specific duties:

a. Before Operation

(1) Stand inspection.

(2) Ensure personnel door secured.

(3) Check hull and drain plugs.

(4) Check tow cable and pintle.

(5) Check sea tow quick release.

(6) Check track and suspension system.

(7) Check drive sprockets.

(8) Check equipment stowed on the outside of the vehicle (boat hooks, boarding ladders, etc.).

(9) Serve as ground guide to ensure that no one is in the vicinity of the ramp when it is raised or lowered.

(10) Report deficiencies to the crew chief.

b. During Operation

(1) Be on the alert for unusual noises or odors.

(2) Check personnel door.

(3) Report vehicular malfunctions to the crew chief.

c. At the Halt

(1) Check the hull.

(2) Check track and suspension system.

(3) Check equipment stowed on the outside of the vehicle.

(4) Check tow cables and hitches.

(5) Check drive sprockets.

(6) Serve as ground guide to ensure that no one is near the ramp when it is raised or lowered.

(7) Report any deficiencies to the crew chief.

d. After Operation

(1) Check track and suspension system.

(2) Check drive sprockets for loose bolts or nuts.

(3) Check the hull and towing devices.

(4) Serve as ground guide to ensure that no one is near the ramp during raising or lowering.

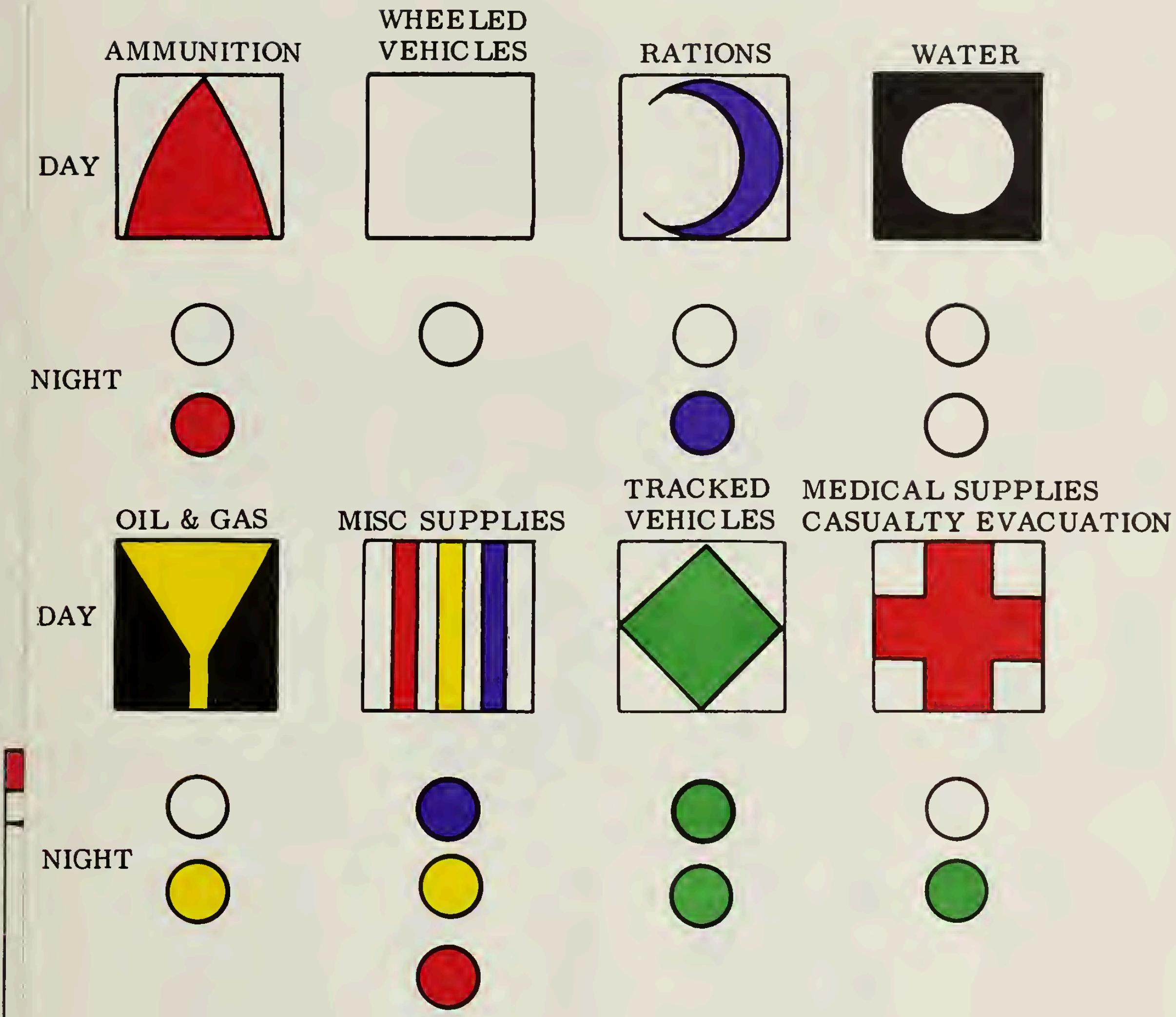
(5) Report any deficiencies to the crew chief.

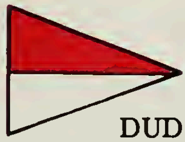
APPENDIX T

ILLUSTRATIONS OF STANDARD FLAGS, LIGHTS, AND MARKERS USED TO CONTROL AMPHIBIOUS VEHICLES

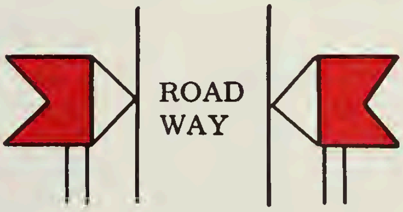
The illustrations contained in figure 76 include markers, flags, and lights which are employed both at sea and ashore in the control of amphibious vehicles. These devices are also standard to landing craft and landing ships. Appendix C to NWP 22-3, Ship-to-Shore Movement, contains more comprehensive illustrations of all such control means.

UNLOADING POINT MARKERS





DUD FLAG



MINE CLEARED AREA

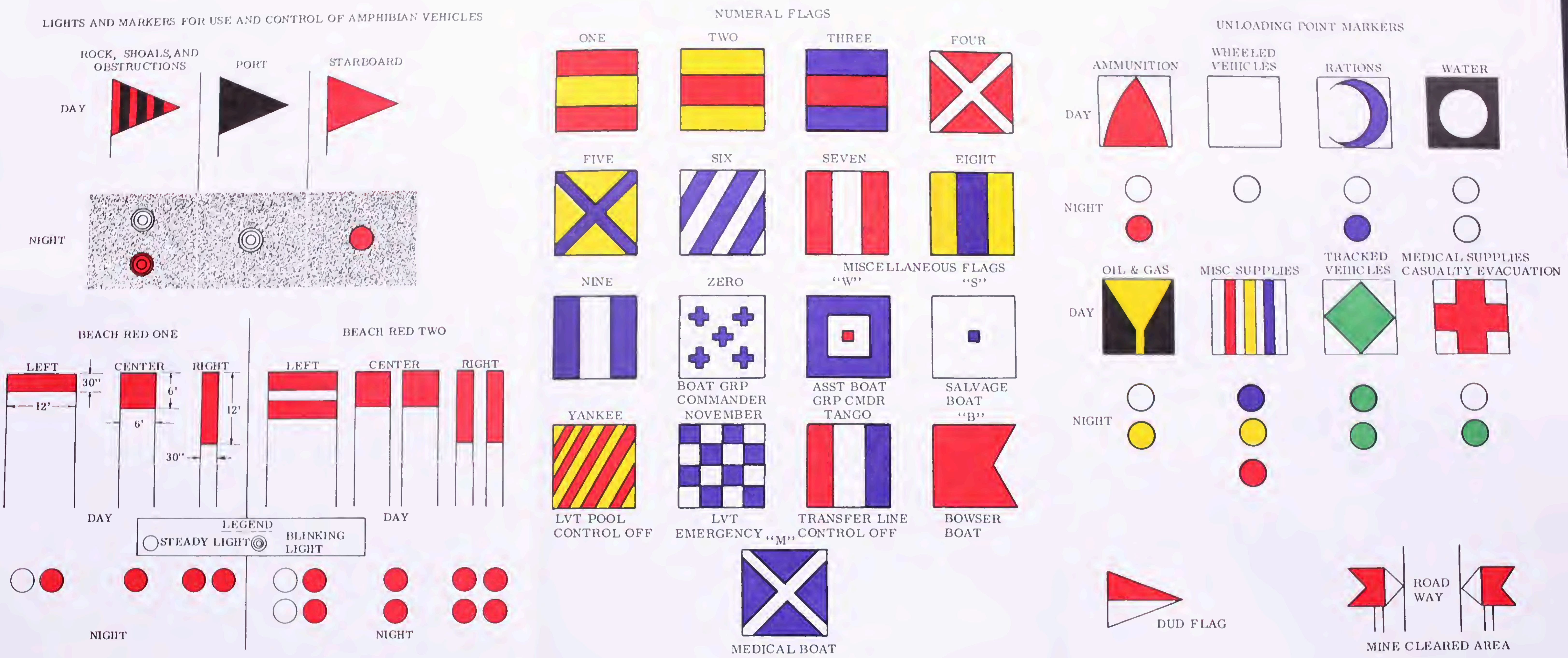


Figure 76.--Illustration of Identification Flags, Lights, and Markers For Use in Controlling Amphibious Vehicles.

LIST OF REFERENCES

1. LANDING FORCE MANUALS

LFM 01, Doctrine for Amphibious Operations
LFM 02, Doctrine for Landing Forces

2. FLEET MARINE FORCE MANUALS

FMFM 2-1, Intelligence
FMFM 3-1, Command and Staff Action
FMFM 3-2, Amphibious Training
FMFM 4-1, Combat Support for Marine Air-Ground Task Forces
FMFM 4-2, Amphibious Embarkation
FMFM 4-3, Landing Support Operations
FMFM 4-4, Engineer Operations
FMFM 6-1, Marine Division
FMFM 6-2, Marine Infantry Regiment
FMFM 6-3, Marine Infantry Battalion
FMFM 6-4, Marine Rifle Company/Platoon
FMFM 7-1, Fire Support Coordination
FMFM 7-4, Field Artillery Support
FMFM 8-1, Special Operations
FMFM 8-2, Counterinsurgency Operations
FMFM 8-4, Doctrine for Navy/Marine Corps Joint Riverine Operations
FMFM 9-1, Tank Employment/Antimechanized Operations
FMFM 10-1, Communications

3. NAVAL PUBLICATIONS

NWP 22-3, Ship-to-Shore Movement
NWP 22-4, Underwater Demolition Teams in Amphibious Operations (U)
ATP 17, Naval Arctic Operations

4. SUPPLY PUBLICATIONS

SL 1-2, List of Supply and Maintenance Publications

5. U.S. ARMY FIELD MANUALS

FM 17-12, Tank Gunnery
FM 17-15, Tank Units, Platoon, Company, and Battalion
FM 20-22, Vehicle Recovery Operations
FM 21-6, Techniques of Military Instruction
FM 31-25, Desert Operations
FM 31-60, River Crossing Operations
FM 31-70, Basic Cold Weather Manual
FM 31-71, Northern Operations
FM 31-72, Mountain Operations

6. STANDARDIZATION AGREEMENTS BETWEEN NATO NATIONS (STANAG)

2146, Infantry and Armoured Fighting Vehicles (AFV) Operations

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